

SMITHSONIAN MISCELLANEOUS COLLECTIONS.

144

LAND AND FRESH-WATER SHELLS

OF

NORTH AMERICA.

PART III.

AMPULLARIIDÆ, VALVATIDÆ, VIVIPARIDÆ, FRESH-WATER
RISSOIDÆ, CYCLOPHORIDÆ, TRUNCATELLIDÆ,
FRESH-WATER NERITIDÆ, HELICINIDÆ.

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PREFACE.

THIS volume, prepared at the request of the Smithsonian Institution, is devoted to all the operculated land and fresh-water mollusks of North America, excepting the family of *Melanians*. The descriptions of the *Cyclophoridae*, *Truncatellidae*, and *Helicinidae* have already been published in the "Terrestrial Mollusks of the United States," Vols. 2 and 4. It will be seen, however, that these families are now grouped according to their lingual dentition and breathing organs, and not collectively as *Pneumonopoma*. In treating the fresh-water families, it has been considered better to give the original description, or an English translation of it, and a fac-simile in outline of the original figure of each species and synonym. This work must, therefore, be considered rather as a report on the present state of our knowledge of the subject. When the large area over which the species range shall have been explored and full suites of specimens obtained of every age, variety and locality, and when this volume shall have elicited criticism and prompted research, a complete monograph may then be prepared on the decisions of which the student can fully rely as correct.

An extensive correspondence with all the living American conchologists, and opportunities of examining the original specimens from which the descriptions of almost all the species were drawn, have enabled me to eliminate from the list of species a large number of synonyms. The original description and figure of these being given, the student can judge for himself of the correctness of my conclusions.

The descriptions of families and genera of the *Viviparidae* and *Rissoidae* are adopted from Dr. Stimpson, those of the former from his manuscript, of the latter from a paper entitled "Researches on the Hydrobiinae and Allied Forms," lately published

by the Smithsonian Institution. In the remainder of the work the descriptions of the "Genera of Recent Mollusca have been adopted."

The original figures of shells and lingual dentition were drawn by Mr. E. S. Morse, of Gorham, Maine.

The subject is brought down to January, 1864.

W. G. BINNEY.

BALTIMORE, N. J., September, 1865.

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LAND AND FRESH-WATER SHELLS
OF
NORTH AMERICA.

III.

FAMILY AMPULLARIIDAE.

LINGUAL membrane with seven series of teeth (3, 1, 3), central teeth acute, lateral subulate. Rostrum divided into two long tentacular lobes in front; tentacles long and fili-

Fig. 1.



Animal of *Pomus depressus*, reduced one-half.

Fig. 2.



Lingual dentition of *Pomus depressus*.

form; eyes on peduncles at the outer bases of the tentacles. Mantle with a more or less elongated siphon on the left side in front; left gill rudimentary; mantle cavity with a large pulmonary sac on each side. Rectum not traversing the heart. Foot simple. Operculum annu-

lar, regular. Shell spiral, turbate, covered with an olivaceous epidermis; aperture simple in front. Jaws present.

The *Ampullariidae* are fluviatile, and represent in the ponds and rivers of the tropics the *Viviparidae* of more temperate climates. Although distinct gills exist, the respiratory cavity is very large and partly closed, so as to enable these animals to live a long time out of water; in fact, they appear to be

truly amphibious, and to be enabled to survive a long drought, and have been known to revive after having been kept several years out of water. The long siphonal tube appears to be formed by the left neck-lappet, which is seen in the *Viviparidae* in a rudimentary state.

But one genus of this family is represented in North America. In order, however, that the others may be understood by those not having access to the more recent works on general Conchology, I have added below the descriptions of H. & A. Adams.

Genus **Ampullaria**.—Respiratory siphon elongate. Operculum horny, with an external shelly coat. Shell globose, umbilicated; spire small, last whirl ventricose; aperture oblong, entire, peristome continuous, slightly reflexed, with an internal thickened rim or ledge.

Genus **Pomus**, HUMPHREY, characterized as below.

Genus **Marisa**, GRAY.—Siphon elongate. Operculum horny, dextral. Shell dextral, depressed, discoidal, deeply and widely umbilicated; spire very short, whorls rounded; aperture suborbicular, entire, peristome thin, simple.

Genus **Pomella**, GRAY.—Operculum horny, dextral. Shell solid, spire short, whorls transversely striated, the last very large; aperture semi-ovate, inner lip concave, broad, flattened, peristome simple, acute.

Genus **Lanistes**, MONTFORT.—Operculum horny, sinistral, or with the nucleus on the left margin. Shell depressed, thin, sinistral, deeply and widely umbilicated; spire short; aperture oblong, entire; inner lip expanded over the last whorl, peristome simple, acute.

Genus **Meladomus**, SWAINSON.—Operculum horny, sinistral. Shell sinistral, thin, imperforate, covered with a dark olivaceous epidermis; spire produced, acuminate; aperture oval, reversed, contracted and acute posteriorly, entire in front, peristome thin, simple.

Genus **Asolene**, D'ORBIGNY.—Siphon not exposed. Operculum horny, with an internal shelly coat. Shell globose, solid; spire small, whorls rounded; aperture oval, entire; inner lip slightly thickened, peristome simple, acute.

POMUS, HUMPHREY.

Siphon elongate. Operculum horny, dextral. Shell dextral, globose, widely umbilicated, last whirl very large, ventricose; spire short; aperture entire, oblong, large, expanded, peritreme simple, always thin, sometimes subreflexed.

The genus *Pomus* differs from *Ampullaria* in the absence of the thickened ledge within the peritreme for the operculum, which latter, moreover, is entirely horny. The species inhabit the lakes and rivers of warm countries, more especially those of South America and the West Indies. In the dry season they bury themselves deeply in the mud, where they remain in a state of torpidity, and, on account of their possessing a pulmonary cavity in addition to the gills, they are enabled sometimes to survive a considerable period after having been removed from the water. The South American Indians term them "Idol Shells," and are said to hold them in great veneration.

Fig. 3.

*Pomus depressa.*

***Pomus depressa*, SAV.**—Shell ventricose, subglobular, obsoletely banded with obscure green; whorls four, slightly wrinkled; body whorl more prominent above, somewhat flattened towards the suture, of a pale olivaceous color, which is almost concealed by numerous unequal, longitudinal and transverse greenish and brownish lines; spire very much depressed; aperture suboval, within somewhat glaucous, on the margin exhibiting the bands distinctly; labrum simple, as much rounded above as below; umbilicus small, nearly closed. Greatest width one inch and nine-twentieths, total length one inch and a half; length of the aperture one and one-fifth of an inch nearly.

Inhabits East Florida.

Fig. 4.

*Ampullaria depressa.*

During an excursion to East Florida, in company with Messrs. MacIure, Ord, and T. Peale, I obtained a single dead and imperfect specimen of this interesting shell. It occurred in a small creek, tributary to St. John's River, and on the plantation of Mr. Fatio. Captain Le Conte, of the Topographical Engineers, has since presented me with a perfect specimen, with the information that he observed them in very great numbers on the shores of Lake George, a dilatation of St. John's River; that in some places the dead shells were piled up confusedly to a considerable height, and that the *Numenius longirostris* feeds upon the living animal. The spire is still less elevated than that of the *globosa* of Swainson.

Ampullaria depressa.—As the name *depressa* of the Appendix to Long's Exped. p. 264, is preoccupied by Lamarck for a fossil species, it may be changed to *paludosa*. (Say.)

Ampullaria depressa, SAY, Long's Ex. 264, pl. xiv, f. 2; BIRNEY's ed. p. 130, pl. lxxiii, f. 2.—HALDEMAN, Mon. p. 5, pl. 1, li.—DE KAY, N. Y. Moll. 124.—HANLEY, Conch. Misc. pl. iii, f. 9.—PHILIPPI, in Chemn. ed. 2, p. 52, pl. xvi, f. 4.

Ampullaria paludosa, SAY, New Harm. Diss. II. 260; Desc. 22; BIRNEY's ed. p. 147.

Ampullaria hepstonensis, LAM, Tr. Am. Phil. S. V, 115, pl. xix, f. 84; Obs. I, 227.—DE KAY, N. Y. Moll. 124.—REEVE, Con. Icon. fig. 60.—PHILIPPI, in Chemn. ed. 2, p. 36, pl. ix, f. 7.

Figure 5 represents the lingual dentition of a specimen of

Fig. 5.



Lingual dentition of *Pomus depressa*.

Fig. 6.



Pomus depressa.

Pomus depressa kindly furnished me by Prof. Agassiz. The teeth are light brown in color, and make thirty-four rows in all; the first and second laterals are notched and the third is simple. The central tooth has seven denticles, the central one quite large, the next two short and blunt, and the last rather long and blunt.

Mr. Say proposed the name *paludosa* because his first name, *depressa*, was preoccupied by Lamarck, An. s. Vert. 1822. Since, however, that *Ampullaria depressa*, Lam. has been removed to the genus *Natica*, I adopt Mr. Say's first name. Figs. 1 and 3, represent the animal and operculum of this

species, the former, copied from Haldeman, being reduced in size. Fig. 4 is a fac-simile of the outline of Say's figure, and fig. 7 of Mr. Lea's of *A. hopetonensis*. Fig. 6 represents a specimen from Georgia. I have no doubt of the identity of this last named species with *depressa* after examining the typical specimen. No. 8986 and 8987 were labelled by Mr. Lea as *hopetonensis*. Haldeman also places it in the synonymy. The original description here follows, and an outline of the figure (7).

Ampullaria hopetonensis.—Shell subventricose, smooth, flattened above, umbilicate, yellowish-brown, banded; sutures impressed; whorls 5; aperture subovate, white.

Habitat Hopeton, near Darien, Ga. Prof. Shepard. My cabinet; cabinet of Prof. Shepard. Diam. 1.4, length 1.7 inch. I owe to the kindness of Prof. Shepard of New Haven this interesting shell. It was procured by him during his late geological investigations in our Southern States, with other shells, descriptions of which will be found in these memoirs. It resembles the *A. fasciata*, Lam., but is less globose, the whorls of our species being somewhat flattened on the side and top. It differs from the *A. depressa*, Say, described in Major Long's Exp. to St. Peter's River (subsequently changed to *A. paludosa* in the Disseminator) in being less globose, and in being flatter on the side and superior part of the whorls. (Lea.)

Fig. 7.

*Ampullaria hopetonensis*.

Inhabits Georgia and Florida.

In the preliminary Report on N. Y. Moll. 1839, 32, *A. paludosa* is included erroneously.

DeKay gives as synonyms *A. penesima*, Say, and *A. disseminata*, Say. The names do not occur in Say's writings, though the last is suggestive of the periodical in which the description of *A. paludosa* appeared. Dr. Martens (Mal. Blatt. IV, 204) refers *A. depressa* and *A. paludosa* to *A. hopetonensis*, disregarding the priority of Say's names.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8984	2	Florida.	W. G. Binney.	.....
8986	1	Silver Spring L., Fla.	O. M. Dorman.	.....
8987	1	"	W. G. Binney.	.....
8988	1	Georgia.	J. O. Anthony.	.....
9306	..	"	L. Agassiz.	Ling. Fig. 8.

SPURIOUS AND EXTRA-LIMITAL SPECIES OF AMPULLARIIDÆ.

This family does not appear to belong to the molluscons fauna of the United States, but rather to that of South America. I have not, therefore, included the Mexican species.

Ampullaria crassa, DEHAYES. Vide *Melantho ponderosa*.

Ampullaria borealis, VALENCIENNES, in Humboldt and Bonpland, Rec. d'Obs. II, 260, is probably *Lunatia heros*, Say. Ferussac (Bull. Zool. 1835, 2d sect. p. 33), in reviewing Valenciennes' work, refers it to a large marine *Natica* figured by Chemnitz. The description is as follows:—

"Shall ventricose, globose, heavy, thick, smoky white, broadly umbilicated, with longitudinal striae but no wrinkles.

St. Pierre and Miquelon, near Newfoundland.

This species resembles *Ara. guyanensis*. Its proportions are the same; it is longitudinally striate, but its shell is at least three times as thick, so that it is quite heavy. It is also distinguished by its very large umbilicus, while *A. guyanensis* has none. The color is yellowish or light reddish on the top of the last whorl; the base is white."—*Valenciennes*.

Ampullaria rotundata, SAY.—Shell remarkably globose; length and breadth equal, dark brown, but becoming olivaceous towards the aperture; spire but little elevated; suture moderately impressed; body whorl a little undulated instead of being wrinkled; these undulations being very perceptible to the finger within the shell; aperture within on the margin thickened equally all round, and fulvous, with a slight groove for the reception of the operculum, hardly visible but palpable; within somewhat perlaceous; a little darker on the columella; umbilicus small, narrow; operculum calcareous, deeply and concentrically rugose, so as to appear stratified; nucleus on the side towards the labium submarginal. Length less than one inch and four-fifths; greatest breadth about the same.

For this interesting species we are indebted to Captain Leconte, of the Topographical Engineers, who informed me that he found it in St. John's River, in Florida.

It is most closely allied to the *A. globosa*, Swainson, a native of the rivers of India. But that shell is rather less globose, and does not appear to have the almost regular, but slightly elevated and very numerous undulations so perceptible towards the aperture on the body whorl of this species; which has also a few hardly perceptible, distant, brownish bands, particularly towards the base. It may, however, be only a variety of that species. (*Say*.)

Ampullaria rotundata, SAY, N. Harmony Diss. II, 245; Discr. 27; BIXBY'S ed. p. 147, pl. lxxv.—PHILIPPI, in Chemn. ed. 2, p. 68.

Ampullaria globosa, HALDEMAN, Mon. p. 8.—SWAINSON, Zool. HL II, 119.

I do not consider this and *Vivipara elongata* well established American species. If actually found in Florida, they were probably brought from Calcutta, where they both are found.

Ampullaria urceus, MÜLLER (*A. rugosa*, Lam.), is found in Mexico. (Vid. Humboldt & Bonpland, Rec. d'Obs. II, p. 258.) Of its presence in the Mississippi Mr. Say says: The "*Ampullaria urceus*, L. (*rugosa*, Lam.) is stated in the books to inhabit the Mississippi River; but I have never been so fortunate as to find it, or to gain any information relative to it there. Mr. O. Evans did me the favor to make inquiry at various places on that river, and to exhibit, as somewhat similar, a colored plate of the *A. globosa*, Swains., to persons from whom information might be expected, and amongst others to some Indians, who in general are known to be accurate observers; but no one has seen any similar shell in the waters of the Mississippi. I am therefore much inclined to believe that the species is a native of some of the more southern rivers, probably those of Texas. Any information in relation to it, or specimens of the shell, will be very acceptable." (BIXNEY's ed. p. 195.) See also HALDEMAN, Mon. p. 11; MONTFORT, Conch. Syst. II, p. 244; LAMARCK, An. s. Vert. &c.

Ampullaria flagellato, SAY, N. H. Diss. II, 260; Descr. 22; BIXNEY's ed. p. 147.—HALDEMAN, Mon. p. 10.—PHILIPPI, in Chemn. ed. 2, p. 38, pl. ix, f. 7. Near Vera Cruz (Mexico).

Ampullaria flutilla, REEVE, Con. Icon. pl. vii, fig. 31 (1856). Tobacco, Mexico.

Ampullaria cerasum, HAWLEY, Conch. Misc., Mexico.

Ampullaria mittocheilus, REEVE, Con. Icon. fig. 120. Chiapa, Mexico.

Ampullaria Ghiesbreghtii, REEVE, Con. Icon. fig. 123. Chiapas, Mexico.

Ampullaria fumata, REEVE, Con. Icon. 124. Chiapas, Mexico.

Ampullaria violacea, VALENCIENNES, Rec. d'Obs. II, 260.

Ampullaria reflexa, SWAINSON, Phil. Mag. LXI, 377.

Ampullaria malleata, JONAS, Moll. Brit. I. 22.

Ampullaria paludinosides, CRIST., and JAN in Chemn. ed. 2, p. 27.

Ampullaria scalaris, D'ORN. Mag. de Zool. 1835, p. 31. (*A. angulata*, JAY, Cat. earlier ed., not of DUNKER.)

Pomacea linearis, PERRY, Conchology, pl. xxxviii, fig. 2.—Shell pale reddish-brown, slightly spotted with pale pink spots; mouth slightly shaded with a broad band of brown reaching round the body; the rim yellow. The shell is found on the coasts of North America, and is drawn from a specimen in the collection of Mr. Stuart. (Perry.)

This is the original description, and a copy of Perry's figure reduced one-half. I know nothing of the species.

Fig. 8.



Pomacea linearis.

FOSSIL SPECIES.

Ampullaria ? perovata, CONRAD, Proc. Acad. Nat. Sc. Philad. III, 21, pl. 1, fig. iii.

FAMILY VALVATIDAE.

Lingual membrane with teeth in seven series (3, 1, 3); the central teeth broad, with a hooked and denticulated apex,

Fig. 9.

Lingual dentition of *Valvata tricarinata*.

the lateral lanceolate, hooked and denticulated. Rostrum produced; tentacles cylindrical; the eyes sessile at their external bases. Mantle simple in front; gill plumose, exposed, the lamina pinnate, spirally twisted, protected by a long, slender respiratory lobe. Foot bilobed in front. Opereculum horny, orbicular, spiral, many whirled; whirls with a thin elevated edge. Shell spiral, turbinate or discoidal, covered with an epidermis; aperture with the peritreme entire.

The species of this family are distributed throughout the temperate regions of the globe, living in slow running rivers, ditches, and lakes.

I have copied Haldeman's figure of *Valvata sincera* to illustrate the animal of this family (fig. 11).

VALVATA, O. F. MÜLL.

Fig. 11.

*Valvata sincera*, greatly magnified.

Shell turbinate or discoidal, umbilicated, thin, whirls round, simple or keeled, covered with a horny epidermis; aperture circular, peristome continuous.

The species of this small genus inhabit the ponds and ditches of Europe and North America. When the animal progresses, the delicate, retractile, branchial plume is projected over the neck. The female

deposits her eggs in a single, coriaceous, spherical capsule, which is affixed to stones or the stems of aquatic plants. Jaws present.

Valvata tricarinata, SAY.—Shell with three volutions; three revolving, carinate, prominent lines, giving to the whorls a quadrate instead of a cylindrical appearance. Suture canalliculate, in consequence of the whorls revolving below the second carina and leaving an interval. Spire convex, apex obtuse. Umbilicus large. Carinae placed, one on the upper edge of the whorl, one on the lower edge, and the third on the base beneath. Breadth one-fifth of an inch.

Inhabits the river Delaware. Rare. Found by Mr. Le Sueur, whose proposed name is here adopted. (Say.)

Cyclotoma tricarinata, SAY, J. Acad. N. S. Phil. I, 13, 1817; Nich. Ency. ed. 3; BINNEY'S ed. p. 68, 59, 56.

Valvata tricarinata, SAY, Journ. Acad. II, 173; BINNEY'S ed. 68.—DE-SHAYES in Lam. VIII, 507; Tr. El. de Conch. pl. lxxii, f. 4-6.—MENER, Zeit. f. Mal. 1845, p. 121.—HALDEMAN, Mon. III, pl. i, f. 1-4.—GOLD, Invert. 225, f. 156.—DEKAY, N. Y. Moll. p. 118, pl. vi, f. 130. ANOSTOMER, Can. Nat. II, 213, fig.—ADAMS, Thompson, VI, 152.

Valvata carinata, SOWERBY, Gen. Shells, xli, f. 2.

Valvata unicarinata, DEKAY, N. Y. Moll. 118, pl. vi, f. 129.

Valvata bicarinata, LEA? Tr. Am. Phil. Soc. IX, 21; Obs. IV, 21; Proc. II, 81, 83; Arch. f. Nat. 1843, II, 129.

Tropidina curinata, CHENU, Man. de Conch. II, 312, fig. 2232.

Troschel (*Gebiss der Schnecken*, p. 96, pl. vi, f. 14) figures the lingual ribbon of this species.

Fig. 12.



Lingual dentition of *Valvata tricarinata*.

This is a very variable species, as shown by No. 8981 of the collection. Variety *simplex* is contained in No. 8982; bicarinated forms in 8941. Mr. Say's specimens of *Valvata tricarinata* are still preserved in the collection of the Philadelphia Academy of Natural Sciences. From an examination of them and of Mr. Lea's original *Valvata bicarinata* I am convinced of the identity of the two. I have given (fig. 13) a figure of Mr. Lea's shell and his description below. Haldeman refers it with doubt to *tricarinata*.

I have not seen authentic specimens of the other species men-

Fig. 13.



Valvata tricarinata.

tioned in the synonymy. The original descriptions and fac-similes of the original figures now follow.

Valvata bicarinata, LEA.—Shell orbicular, flattened above, bicarinate, rather thick, horn-colored above, whitish below, widely umbilicate; sutures impressed; spire depressed; whorls four, convex; aperture rounded, whitish within.

Body rather short and white, head large, tapering, slightly enlarged at the anterior termination, with a black mark passing from the neck between the eyes, tapering off and reaching nearly to the end of the snout, where there are two oblique black marks bordered in front by white, and accompanied behind by several irregular white spots, the anterior ones being the larger. Branchia translucent, superior portion blackish, bordered with white spots and occasionally obtruded;



eyes round and deep black, placed at the posterior base of the tentacula, surrounded by a white area; tentacula long, rather tapering, obtuse at the end; filament rather short, translucent with longitudinal white lines; foot wide and furcate anteriorly, where minute white spots may be observed. Operculum thin, semitransparent, light horn color, increment circular and rather coarse.

Schnytkill River, west side, below Permanent Bridge. H. C. Lea. My cabinet. Diam. .30, length .12 inch.

In the form of the shell, this species closely resembles the *tricarinata*, Say. It differs in having but two carinae, in having a wider umbilicus, and the spire is more depressed. The animals of the two species differ in form and color more than the shells.

The head of the *tricarinata* is more cylindrical and enlarged at the termination, where it somewhat resembles the snout of the hog, while that of the *bicarinata* is more conical and without so sudden an enlargement at the end. The color of the *bicarinata* is lighter. In the black markings they also differ. In the *tricarinata* there is a single blotch anterior to the area between the eyes. In the *bicarinata* this extends also behind this area; and in addition may be observed two quite black marks above the mouth, which the *tricarinata* does not seem to have. The tentacula of the *bicarinata* are larger and more filiform. When in motion, the anterior portions of the lobes of the foot are pointed, and recurved or hooked.

The shell of the *bicarinata* is quite light colored beneath, and rather a dark horn color above, the change of color taking place a short distance above the periphery of the whorl, between which and the superior carina it is quite dark. The superior carina is large and erect, the inferior one is smaller. All the whorls are visible beneath. Very minute longitudinal striae cover the whole surface.

Having several living specimens of both these species, I observed them closely with a lens while under water in a glass vessel. On the 15th of May, while I had a *tricarinata* at the focus of my lens, I observed a small

apple green, globose object, passing from under the aperture of the shell. This was shortly followed by others, and soon a transparent gelatinous mass became visible. This mass was passed slowly over the right side of the neck, under the pectiniform movable branchie, until entirely discharged against the perpendicular side of the vessel in which it was kept, and there the mass remained attached, the parent having abandoned it immediately. The time was fifteen minutes from the first appearance of the mass until it was fairly discharged. The green globules were the ova, of which I counted thirty in the transparent, globose gelatinous mass, which was not more in diameter than one-twentieth of an inch, the transverse diameter of the shell being about four-twentieths of an inch. In other cases, I found the number of ova to differ; some masses having only ten or twelve.

On the 23d (eight days after), the ova were so far advanced as to be changed to a dull faded green, the mass enveloping them having changed by degrees in transparency, and becoming of a slightly ferruginous color. As yet, no change of bulk or arrangement was observed.

On the 29th (fourteen days after), the mass was observed to be opened, and with a lens of considerable power I could plainly see a motion in most of the ova, the rounded form of the shell being easily discerned within.

On the 30th (fifteen days after), most of the young shells had broken their filmy bonds, only six or seven remaining: their motion was very apparent, and their minute black eyes could be plainly seen. I observed to-day, for the first time, that the *Valvata* has the power of swimming, inverted from the surface of the water, like the *Planorbis*, *Physa*, &c. Most of the young were in that position, and could move comparatively fast. The action of the mouth in the adult, when swimming in this way, was constant, and changed from an oval to a circular form.

From the above observations, we may conclude that the *Valvata tricarinata* requires from fourteen to fifteen days to be perfected in the ovum, from the time it is ejected and abandoned by its parent. The *bicarinata*, I have no doubt, requires the same time. Numerous globules were deposited about the glass, which globules appeared all to resemble each other, and nearly all the individuals were of the species *bicarinata*. (Lea.)

Fig. 15.

*V. carinata*.

Valvata carinata, SOWB., l. c., is figured only; no description is given (fig. 15).

Valvata unicarinata, DEKAY.—Shell small, apex depressed; whorls 3 or 4, impressed with minute incremental striae, all flattened above and bounded by a revolving rib or keel, which in the younger individuals ascends to the summit: aperture circular, nearly vertical, scarcely modified by the keel; opercle corneous, thin, with concentric striae; umbilicus wide, profound, exhibiting all the volutions; color milky bluish-white; apex often tinged with rufous. Height .1, diam. .15.

Fig. 16.

*Valvata unicarinata*.

These dimensions are from one of the largest size, obtained from Lake Champlain, where they are very abundant, and from the Erie Canal. It is allied to the preceding (*V. tricarinata*), and forms the passage to *V. sincera*. Some eminent conchologists suppose this, and perhaps the following (*V. sincera*) to be more varieties of *V. tricarinata*. It approaches the *V. Aumeralis*, Say, from Mexico; but it is smaller, not so much depressed, and has a wider umbilicus. (*De Kay*.)

I have evidence of its ranging at least from New England and Pennsylvania to Council Bluff and Methy Lake, lat. 57°.

Haldeman says the ova are deposited from the first day of March to the end of July, in transparent masses half a line in diameter, each containing a number of germs of a bright green color dotted with yellow.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8074	150+	Mohawk, N. Y.	Dr. J. Lewis	.....
8079	1	Ann Arbor, Mich.	Prof. Wischell.	.....
8080	10	Milwaukee, Wis.	L. A. Lopham.	.....
8081	20+	Herkimer, N. Y.	Dr. Lewis.	vars.
8082	20+	Little Lakes, N. Y.	"	var. simplex.
8037	6	" "	"	" "
8041	5	" "	"	var. bicarinata.
8038	5	Burlington, N. J.	W. G. Binney.	.....
8058	50+	Grand Rapids, Mich.	Dr. Lewis	.....
8059	100+	Schuyler's Lake.	"	.....
8060	100+	Mohawk River.	"	.....
8061	20	Little Lakes, N. Y.	"	.....
8203	2	Orier Tail Creek, Min.	R. Keenleott.	.....
8292	5	Great Slave Lake.	"	.....

Valvata sincera, Sav.—Shell subglobose-conic; whorls nearly four, accurately rounded, finely and regularly wrinkled across; aperture not interrupted by the penultimate whorl, nor appressed to it, but merely in contact with it, the labrum not diminished in thickness at the point of contact; umbilicus large, exhibiting the volutions. Breadth less than 1.5 inch. Inhabits Northwest Territory.

Fig. 17.

*V. sincera*.

For this species I am indebted to Dr. Bigsby. It is very similar to the *tricarinata*, Nobis, but it is destitute of carinated lines and the umbilicus is rather larger; it differs from the *obtus* of Europe also, in the much greater magnitude of the umbilicus. (*Say*.)

Valvata sincera, Sav, Long's Ex. 264, pl. xv, f. 11; BINNEY's ed. p. 130, pl. lxxiv, f. 11.—HALDEMAN, Mon. p. 6, pl. i, f. 5-10.—ADAMS, Sh. of Vt. in THOMAS. Vt. p. 152; Am. Jour. Sc. [1], XI, 267.—DEKAY, N. Y. Moll. 119, pl. vi, f. 127, 128.

Valvata depressa, pars, KÜSTER in Chemn. ed. 2, p. 83 (1853).—MEXKE, Zeit. für Mal. II, 122, 1845 (including *tricarinata* and *simplex*).

Valvata striata, LEWIS, Pr. Phil. Ac. N. Sc. 1856, p. 260.

The outline figure published by Say and copied in my figure 16 is not very satisfactory, nor have I ever seen specimens referred to this species which can easily be distinguished from eecarinate forms of *V. tricarinata*. Fig. 11 is a view of the animal copied from Haldeman. Kirtland quotes it from Ohio.

I give also a figure of a specimen of *V. striata* furnished by Dr. Lewis. I have no doubt of its identity with *V. sincera*. The name is preoccupied by Philippi, Enum. Moll., p. 157. Dr. Lewis' description is as follows:—

Valvata striata.—Shell conical, depressed, umbilicate; aperture round; epidermis brown and very regularly striate. Has all the other features of *sincera* except color and translucency. Animal not observed. Very rarely seen. Of several hundred specimens of *Valvata* only seven were this species. (Lewis.)

Fig. 18.

*V. striata*.

No. 8936 of the collection was labelled *V. sincera* by Dr. R. E. Griffith.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8945	5	Madison, Wis.	I. A. Lapham.	.....
8936	..	.....	Phil. A. N. S.	Cabinet series.
9296	2	Peace River.	.....	.....
9297	7	Upper Mackenzie R.	.....	.....
9294	13	Great Slave Lake.	Keenleott.	.....

Valvata pupoidea, Germ.—Shell small, elongate-ovate, opaque, chestnut-colored, when divested of the rough, dirty pigment which usually adheres closely to it; whorls four or five, minutely wrinkled, the posterior one small and flattened so as to form an obtuse apex; the others cylindrical, and so partially in contact as to expose about one-half of the cylinder; the last entirely disjoined from the preceding one for at least the half of a revolution; aperture circular, lip simple and sharp; on looking at the shell from below, no umbilical opening is found; operculum horny, apex central, elements concentric. Length .1, breadth 3-40 inch.

Fig. 19.

*Valvata pupoidea*.

Found at Fresh Pond and other ponds, on stones and submerged sticks; and has been for many years in our cabinets marked as a *Paludina*.

Animal very active; head proboscideiform, half as long as the tentacles, bilobed in front, dark, terminated with light; tentacles rather stout, light drab-colored, with a line of silvery dots on the upper side, over the large, black eyes; foot, tongue-shaped, as long as the first whorl, dilated into two acute angles in front, light drab-colored; respiratory organ occasionally protruded to half the length of a tentacle on the right side.

This species is widely distinguished from all other described ones by its minuteness, its color, its elongated form, and its want of an umbilicus; of

which characters the last two seem to arise from the loose manner in which the whirls are united. (*Gould.*)

Valvata pupoidea, GOULD, Am. Journ. Sc. 1st ser. XXXVIII, p. 196, 1840;
Invert. of Mass. p. 226, f. 155; Olla, 180.—HALDEMAN, Mon. p. 10,
pl. i, fig. 11-13.—DEKAY, N. Y. Moll. 119.—CHENE, Man. de Couch.
II, 311, fig. 2230.—ANONYMOUS, Can. Nat. II, 214, fig.

Fig. 19 is an enlarged view of one of Dr. Gould's figures. Found also in Connecticut (*Linsley*), District of Columbia (*Gillard*), Maine (*Mighels*), and Canada (*Can. Nat. i. c.*).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8993	5	Massachusetts.	Dr. J. Lewis.	.....
8992	3	"	W. Stimpson.	Cabinet series.

This species is made the type of a new genus *Lyogyrus*, by Mr. Gill. (Proc. Ac. Nat. Sci. Phil. 1863.) It does not appear to me that there are sufficient grounds for believing it distinct.

Valvata humeralis, SAY.—Shell subglobose, depressed; spire convex, not prominent; whirls three and a half, with the shoulder depressed, plane; wrinkled across, or rather with slightly raised lines; aperture appressed to the penultimate whirl, but not interrupted by it; umbilicus rather large. Greatest breadth, less than one-fifth of an inch.

Inhabits Mexico.

Differs from *V. sincera*, nob. of the Northwest Territory, in being more depressed, and in having a shoulder or plain surface near the suture. The umbilicus is larger than that of the *V. piscinalis*, Müll., and the spire more depressed; that species is also destitute of the depressed shoulder. (*Say.*)

Valvata humeralis, SAY, New Harm. Diss. II, 244; Descr. 22. BINKER's ed. p. 148.—HALDEMAN, Mon. p. 9.—MUSKE, Zeit. für Mal. II, 129.

This Mexican species, not noticed since Mr. Say found it in Mexico, has been quoted from Canada by Bell, Whiteaves, &c. They probably refer to a variety of *V. tricarinata*. Compare *V. virens*.

Valvata virens, TAYLOR.—Shell turbiniform, consisting of four well rounded whirls; spire elevated, apex acute, sutures deeply indented; periphery almost angulated; umbilicus very wide; aperture oval or nearly round, the peristome merely touching the body above. Surface closely striate. Color varying from brilliant to dark-green. Height .5; diam. maj. .5, min. .4; of aperture, length 2.5, breadth 2 mill.

Fig. 20.



Valvata virens.

Clear Lake, California. Wm. M. Gabb. My cabinet, and cabinet of Mr. Gabb. A number of specimens of this species are before me, most of them being about two-thirds grown. It has no American analogue. (Tryon.)

Valvata virens, TRYON, Proc. Phila. Acad. Nat. Sci. May, 1863, 148, pl. i, fig. 11.

I have added to the fac-similes of Mr. Tryon's figures (Fig. 20) an enlarged view of the shell and operculum of this species in Fig. 21.^a The peculiar greenish color of the shell distinguishes it from the other American species. The description may be compared with that of *V. humeralis*, given above.



Valvata virens, greatly enlarged.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9303	3	Clear Lake, Cal.	G. W. Tryon, Jr.	Fig. 20.

SPURIOUS SPECIES.

Valvata arenifera, LEA, Tr. Am. Phil. Soc. IV, 104, pl. xv, f. 36; Obs. I, p. 114. On p. 27 of Vol. V it is said to be the larva case of *Phrygania*. Vide the interesting remarks by Von Siebold on this and similar cases of Phryganidous and other insects in a paper "On a true Parthenogenesis in Moths, &c.," translated by Dallas, London, 1857, p. 28, note. See also CONRAD, N. Fr. Water Sh. p. '2.

Valvata cinerea, SAY, from Western States, is mentioned by name only by Whentley in his Cat. of Shells of U. S., p. 29; also—

Valvata buccata, LEA, Schnylkill.

Valvata lustrica, MENKE, Syn. Meth. Moll. (Zeit. f. M. II, 130.)

Fossil Species.

Valvata parvula, MK. and HEN., Phil. Pr. 1856, 123.

Valvata scabrida, MK. and HEN., Phil. Pr. 1860, 418.

Valvata subumbilicata, MK. and HEN., Phil. Pr. 1860, 430.

Planorbis subumbilicatus, MK. and HEN. (1856, 120).

^a Eastern North American?

^b The specimen figured was received from Mr. Tryon.

FAMILY VIVIPARIDÆ.

Lingual membrane with seven series of teeth (3, 1, 3), the central teeth broader; simple or denticulated at their apices.

Fig. 22.

Lingual dentition of *Vivipara subpurpurea* (STIMPSON).

Rostrum simple, moderate; tentacles short, stout, the right hand one, on the male, as large as the rostrum; eyes on peduncles at their exterior base. Foot large, simple. Operculum annular, sometimes with a spiral nucleus. Shell spiral, turbinate, covered with an olivaceous epidermis; aperture simple in front.

VIVIPARA, LAMARCK.

Foot of moderate size, thick, not produced beyond the snout. Colors very dark. Head rather large. Snout of moderate

Fig. 23.

Animal of *V. intertexta*. (Male.)

Fig. 24.

Lingual dentition of *V. intertexta*.

size. Lingual teeth armed with large denticles at their cusps; the central tooth with from seven (*swainsonii*) to eighteen (*sub-*

purpurea) denticles, the intermediate with from seven to twelve, the inner lateral with from five (*swainsonii*) to ten (*georgiana*), and the outer lateral with from five (*subpurpurea*) to sixteen (*bengalensis*). Right tentacle as broad as the snout, and but little shorter than the left, with its extremity truncated and excavated, forming a sheath for the reception of the connate male organ, which projects a little beyond when unsheathed or unfolded. Cervical lappets of each side very large, and folded, trough-shaped, forming with the mantle distinct tubular conduits, on the right side for the ingress, and on the left for the egress, of the water for respiration. Branchial laminae very numerous, narrow, almost linear, and crowded in a single row, but variable in width at base, and diverging at their tips so as to appear to be in three or more rows. (*Stimpson*.) Operculum with the nucleus simple. Shell thin, turbanated, sometimes umbilicated; spire produced, whirls round, smooth or carinated, covered with an olivaceous epidermis; peristome thin, continuous, simple anteriorly.

Fig. 25.

Operculum of
V. georgiana.

Vivipara intertexta, SAY.—Shell subglobose, yellowish-green or brownish, wrinkled, and with minute, very numerous, obsolete revolving, deciduous lines; spire depressed conic, obtuse, truncated, eroded at tip; volutions nearly four; suture rather deeply indented; umbilicus closed by the lateral extension of the columella.

Greatest breadth, from four-fifths to one inch; length, about the same. Inhabits Louisiana.

We collected many of the shells in the marshes near New Orleans and on the banks of the Carondelet canal. It is remarkable for its globular form and for the numerous obsolete lines which seem like equidistant deciduous corrugations of the epidermis, having no effect whatever in modifying the calcareous surface, upon which it exhibits no trace. In good specimens two or three obsolete, pale bands are visible by transmitted light. (*Sag.*)

Fig. 26.

*Paludina intertexta*.

Paludina intertexta, SAY, 1829, New Harmony Diss. II, 244; Am. Conch. 3, pl. xxx, f. 3, 4, 1831; BISSETT's ed. p. 146, 185, pl. xxx, f. 3, 4; ed. CHENU, 42, pl. xi, f. 7-9.—HALDEMAN, Mon. p. 31, pl. x, f. 1-6, 1841.—DEKAY, N. Y. Moll. p. 85 (1843).—PHILIPPI, Conch. II, 8, pl. II, f. 4 (1846).—KÜSTER, in Chemn. ed. 2, p. 16, pl. III, f. 9, 10* (1852).

Paludina transversa, SAY, N. H. Dias. II, 245, 1829; BISSETT's ed. p. 145.—DEKAY, N. Y. Moll. p. 85 (1843).

Ampullaria (?) *intertexta*, HALDEMAN, Mon. Ampullaria, p. 11 (1844?).

In addition to Mr. Say's localities, I have received it from Grand Coteau, St. Laundry Parish, La. (*Blanc*.) Also from South Carolina (*Ravenel*), and from Davenport, Iowa (*Prof. Sheldon*). Very globose specimens of *Vivipara concoloroides* sometimes are readily confounded at first glance with this species. They are umbilicated.



Vivipara intertexta.

Mr. Say's figures are copied above (fig. 26). Fig. 27 represents the front view of a more perfect specimen, No. 8863 of the collection.

Mr. Say's type of *Pal. transversa* is still preserved in the Cabinet of the Philadelphia Academy. It is evidently a young *intertexta*, as suggested by Haldeman. His description follows, with a view of his type (Fig. 28).

Paludina transversa, SAY.—Shell transverse, depressed, orbicular; spire convex; whorls three and a half, with numerous minute, slightly elevated revolving lines; suture not widely indented; body whorl very convex, short; umbilicus small; operculum pale fulvous.

Fig. 28.



Paludina transversa.

Greatest width, two-fifths of an inch. Inhabits Louisiana.

We obtained two specimens in the marshes near New Orleans. It is much wider in proportion to the length than any other species I have seen, exceeding in this respect even *M. subglobosa*, nob., and especially *P. intertexta*, nob., of which latter, in fact, I at first supposed it to be the young, in consequence of its rotundity and the similarity of its capillary lines; but inasmuch as the number of its whorls is nearly the same, whilst the magnitude differs so greatly, I have separated it as a different species. (*Say*.)

Fig. 29.

Lingual dentition of *V. intertexta*.

Fig. 29 represents the lingual dentition of *V. intertexta*. There are forty-eight rows of seven teeth each, the first fifteen or sixteen of a smoky claret color.

The male and female of this species are respectively represented in Figs. 31 and 30.

Fig. 30.

Female of *V. intertexta*.

Fig. 31.

Male of *V. intertexta*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8802	4	Grand Coteau, St. Landry, La.	Rev. A. Blane.	.....
8803	2	Grand Coteau, St. Landry, La.	"	Figured.
8804	2	New Orleans.	Acad. Nat. Sc.	.....
9202	2	Illinois?	Gen. Totten	.....
9305	..	Iowa—Davenport.	Prof. Sheldon.	Lingual ribbon—Fig.
9315	1	" "	"	Female. [28.
9316	1	" "	"	Male.

Vivipara subpurpurea, SAY.—Shell oblong, subovate, olivaceous, with a tinge of purple more or less intense, sometimes hardly perceptible; spire rather obtuse, terminating convexly; whorls five, wrinkled, equally convex; suture impressed, but not very profoundly; aperture much widest in the middle, narrower above; within glaucous, somewhat perlaceous; labrum rectilinear from the middle upwards; umbilicus none. Length about one inch, greatest breadth four-fifths of an inch.

An inhabitant of Fox River, an arm of the Wabash. It is very distinct from any other species I have seen.

Fig. 32.

*Viv. subpurpurea*.

The labrum exhibits no curvature from the middle almost to its junction with the penultimate volution.

Shell subglobular oval, not remarkably thickened; spire longer than the aperture, entire at the tip; whorls five, slightly wrinkled across, rounded but not very convex; penultimate volution somewhat elongated; suture impressed; aperture ovate-orbicular, less than half the length of the shell; labium with calcareous deposit; animal very pale bluish, with minute yellow points, particularly on the rostrum, tentacula, and prominent respiratory tube, which is as long as the tentacula; eyes on the exterior side of the tentacula, near the middle of their length; the anterior portion of the foot is very short.

Fig. 33.



Paludina
subpurpurea,
young.

This species was first found by Mr. Lesueur and Dr. Troost, in Fox River of the Wabash. In the young state the figure is subglobose, and the aperture, although it hardly differs in form from that of the adult, is yet longer than the spire. They become proportionally more elongated as they advance in age, and the form, therefore, of the adult, is so different from that of the young or half grown, that in these states it may, very readily, be mistaken for a widely distinct species.

The color of the shell is variable. In some it is pale horn, more tinged with yellowish than with green; in others are traces of obsolete purplish bands; in many specimens the whole shell is reddish-purple, more or less obscure in different individuals.

Fig. 34.



P. subpur-
purea,
young.

In the autumn it is frequently found between the valves of dead Unios, in which it enters perhaps to hibernate. The species is certainly allied to the *vivipara*, but it cannot well be mistaken for it, as it is much less dilated, the volutions less convex; the penultimate volution is much longer in proportion to the length of the body whorl, and the umbilicus is obsolete. (Say.)

Paludina subpurpurea, SAY, 1829; N. H. Diss. II, 245; Am. Conch. III, pl. xxx, f. 2, 1831; BINNEY'S ed. p. 146, 185, pl. xxx, f. 2; ed. CURRIE, 41, pl. xl, f. 6 —HALDENAY, Mon. p. 28, pl. ix, 1841.—DEKAY, N. Y. Moll. p. 86 (1843).—KÜSTER, Chemn. ed. 2, p. 12, pl. II, fig. 10-13; pl. VII, fig. 3-5.—REEVE, Con. Icon. 47, Feb. 1863.

Vivipara texana, TAYLOR, Pr. Ac. Nat. Sc. (fig.), Sept. 1862, p. 451.—REEVE, Con. Icon. 24 (Feb. 1863).

Mr. Say's original specimens of this species are still preserved in the collection of the Philadelphia Academy. Fig. 35 is taken from one of them.

The surface is often quite smooth and shining, the spire more or less elongated and slender, but generally distinguished by the penultimate whorl, which is very much larger than is usual in our

Vivipara, and when seen from behind, appears remarkably bulging at its upper portion. The umbilicus is not always closed. Fig. 32 is copied from one of Mr. Say's figures. No. 9301 of the collection is figured in Fig. 36.

In the description of the animal Mr. Say speaks of a tubular cylindrical organ as a respiratory syphon, but Haldeman suggests its being probably the outlet of the viscous glands.

A specimen in Mr. Anthony's cabinet measures in extreme length 33, last whirl 19, penultimate 8, antepenultimate $2\frac{1}{2}$ mill., the measurements being taken on the front of the shell.

I have traced this species from Texas through Louisiana and Mississippi to Key West, Florida, and in the Western States of Indiana, Wisconsin, and Missouri.

A more elongated, slender form of the species, which is common in the southwest, from Mississippi to Texas, has been described by Mr. Tryon as a distinct species under the name of *V. texana*. A careful examination of the specimen from which his diagnosis is drawn, as well as the large series in the Smithsonian collection, leaves no doubt in my mind of its identity. The original description and figure are given below. Reeve figures a much less characterized specimen of *V. subpurpurea* as *Pal. texana*, which he considers distinct.

Vivipara texana.—Shell solid, conic, light green colored; spire elongate, suture deeply impressed, apex obtuse; whorls 6, slightly convex; aperture small, suborbicular, equalling two-fifths the shell's length.

Texas. Coll. Acad. Nat. Sciences; Coll. G. W. Tryon, Jr.

Shell solid, narrowly conic, consisting of six whorls, which are somewhat flattened around the upper half of their breadth; suture well marked; aperture suborbicular, equalling two-fifths of the length of the shell; umbilicus covered; epidermis light green with faint red revolving bands.

This shell resembles most the *V. subpurpurea*, Say, but

Fig. 35.

*Vivipara subpurpurea*

Fig. 36.

*Vivipara subpurpurea*

Fig. 37

*Vivipara texana*

is easily distinguished by having six whirls, which are much narrower than in that species. The spire is also almost double the length of that of *subpurpurea*, and the epidermis of a lighter color. (Tryon.)

Fig. 38.



Operculum horny, rounded; nucleus subcentral; lines of accretion concentric.

Operculum of *V. subpurpurea*.

The lingual dentition of *V. subpurpurea* is shown in Fig. 39.

Fig. 39.

Lingual dentition of *Vivipara subpurpurea*. (STIMPSON.)

Cat. No.	No. of sp.	Locality.	From whom received.	Remarks.
8644	9	Natchez.	Col. Wallis.	.....
8645	13	Lake Concordia.	"	.....
8646	8	Mississippi River.	.....	.....
8647	4	.....	.....	Cabinet series.
9210	1	.....	.....	.....
9311	1	.....	W. G. Binney.	Fig. 38.
9314	2	.....	Agassiz.	Figured.

***Vivipara multicarinata*, HALD.**—Shell conic, thin, subdiaphanous, green, whirls 5, longitudinally striate and transversely carinate.

Fig. 40.

*Paludina carinata*.

This *Paludina* is thinner and lighter than our species, and has but 5 whirls. The length is about one-fifth more than that of the last whirl, of which the diameter is about double that of the penultimate whirl; beside the longitudinal striae, there are four carinas, of which the first and third are stronger than the second and fourth, and which cover the whole length of each of the whirls.

The opening is almost circular, yet the vertical is greater than the transverse diameter. The lip is slightly thickened, not acute; the columella, which is hardly distinct from the lip, joins the superior termination of the aperture under a slightly acute angle.

The columella termination of the lip partially covers a very small umbilicus. The length of fully developed shell is 14, its breadth 11 lines. (*Valenciennes*.)

Paludina carinata, VALENCIENNES, in Humboldt and Bonpland (1833), Rec. d'Obs. II, 252, pl. lvi, f. 2, a b.—KÖSTER, in Chemn. ed. 2, p. 28, pl. vi, f. 6, 7.—HALDEMAN, Mon. p. 27, pl. viii (1841).

Paludina multicarinata, HALDEMAN, Mon. pt. 4, p. 4 of cover (1842).

Figure 40 is a fac-simile of that of Valenciennes, whose description is copied above. Prof. Haldeman suggests the name *multicarinata*, as the name *carinata* has also been used by Swanson. I have seen no specimen of the species.

Vivipara constrictoides.—Shell umbilicated, elongately-ovate,

Fig. 41.



Vivipara constrictoides.

rather thin, smooth, shining, the surface scarcely broken by the extremely delicate lines of growth; greenish horn-color, sometimes darker, varied with several longitudinal dark streaks marking the former peristome, and with four well marked brown bands revolving upon the body whirl, of which two only are visible on the penultimate and antepenultimate; under the epidermis of a pale yellowish color, still plainly showing the bands; spire scalariformly turbinated, apex entire, well defined, obtuse; whorls 5, bulging, regularly and

Fig. 42.



Operculum of
Vivipara constrictoides.

rapidly increasing in length, the last ventricose, more than one-half the shell's length, umbilicated; aperture sub-circular, oblique, about half as long as the body whirl, within white, showing plainly the four revolving bands, the lower one very near its base, none of them reaching the edge of the aperture; peristome dark, thin, acute, made continuous by the dark, thin, exerted callus which connects the terminations, somewhat reflected at the umbilicus.

Length of axis 22, greatest breadth of last whirl 18; length of aperture 15, breadth 13 mill.

Operculum horny, concentric, thin, flexible, concave, the nucleus nearer the columellar margin (Fig. 42).

Limnaea vivipara, SAY, Nich. Enc. Am. ed. [1], pl. II, f. 5 (1817) (*Paludina* of later ed.).

Paludina vivipara, SAY, Am. Couch. pl. x, outer figs. (1830); BINNEY's ed. 49, 159, pl. lxx, f. 5; ed. CHENU, 17, pl. II, f. 5, 5a.—HALDEMAN Mon. 17, pl. vi (1841).—DEKAY, N. Y. Moll. 66 (1843).

Paludina linearis, KÜSTER, in Ch. ed. 2, 10, pl. II, f. 6-8; p. 12, pl. IV, f. 4 (1852).

Helix vivipara, RAY, Zool. Text-Book, 196 (1826).

Has been found in Florida, Georgia, South Carolina, Alabama, Arkansas, Missouri, Illinois, Indiana, Michigan.

The specimen (Fig. 41) from which the above description is drawn is probably a male. It is the most scalariform of all that I have seen. The species is variable, the degrees of globoseness being numerous.



Vivipara constrictoides, young.

The umbilicus is rarely entirely closed, even in young shells.

The number and disposition of bands is constant in all the specimens before me; the lower band sometimes is expanded so as to surround and enter the umbilicus.

Fig. 44.



Vivipara constrictoides, young.

The species is readily distinguished from *V. georgiana* by its perfect apex, by the greater globoseness of its whorls—they being more loosely convoluted, and by its more shining surface. Its epidermis is more delicate, and does not peel off like that of *georgiana*.

Fig. 45.



Vivipara constricta, Mill.

Vivipara constrictoides receives its name from its strong resemblance to the *V. constricta* of Europe. It has been by some authors considered identical with that species, and with the

Fig. 46.



Vivipara vivipara, Lin.

exception that the American form has four spiral bands upon the body whorl while the European is described as having but three, I can detect no specific differences between them. It is more upon its geographical distribution that I base my opinion of its being distinct. Our species is found over an area very much vaster than that inhabited by its European analogue. It is not one of the fluviatile species of the circumpolar or boreal regions, common to the three continents, as it is not found farther north than the great lakes. I am inclined to believe that, as with the exception of these circumpolar species the land and fresh-water

molluscous fauna of Europe and America are entirely distinct, we are justified in considering that this *Vivipara* is not identical with the *V. conlecta*.

There exist in Europe two species of *Vivipara*: the *conlecta* (*Cyclostoma*), Millet, and *vivipara* (*Helix*), Lin. It is to the former that our species bears so strong a resemblance, and not to the *vivipara*, as suggested by authors. I have copied Reeves' figures of both species (Figs. 45 and 46) that those not having access to foreign works may compare them with our shells. *V. conlecta* is described as being composed of $5\frac{1}{2}$ prominently turned whirls, convoluted so loosely as to leave a deep umbilicus in the centre; while *V. vivipara* has one whirl less, has moderately ventricose whirls, and is more constrictedly convoluted—the umbilicus being reduced to a mere chink.

I have elsewhere remarked that *V. conlectoides* seems, in respect to form, to hold the same relation to *V. georgiana* as *V. conlecta* does to *V. vivipara*.

I have been unable to obtain living specimens of this species, or any preserved in spirits, from which to examine the lingual membrane.

Mr. Say first mentions this species as early as 1817, describing it as identical with the European *V. vivipara*, as a *Limnea*, and later as a *Paludina*. I give below a copy of his description and figures from the American edition of Nicholson's Encyclopedia (Fig. 47), and the American Conchology (Fig. 48). It will be observed that Say mentions three revolving bands instead of four. I am inclined to attribute this to his overlooking the lowest band, which is quite at the base of the shell and does not extend so far towards the edge of the aperture on the inside.

Paludina vivipara, SAY.—Shell subconic, with six rounded whirls; suture impressed, color olivaceous or pale, with three red-brown bands, of which the middle one is generally smallest, whirls of the spire with but two; aperture suborbicular, more than half the length of the shell.

It is doubtful whether or not this is the same as the *vivipara*, but it certainly approaches very near to it; we, however, refer it to that species until a specific difference can be indicated, which at present we are unable to do; the spire of this species is rather more obtuse, and the suture not so deeply impressed, as in the figures of the European specimens above mentioned. 14

Fig. 47.

*Paludina vivipara*.

DOXOV. Brit. Shells, tab. lxxxvii, *Helix vivipara*.—LISTER, Conch. tab. cxxvi, fig. 26; *Cochlea vivipara fasciata*, &c. &c.

This appears to be one of the many species that are common to North America and Europe. And though the specimens from the two continents

Fig. 48.



Paludina vivipara.

differ a little, yet this difference is so slight as not to be specific. Cuvier remarks that "the female produces living young, which are found in its oviducts, in the spring, in every state of development. Spallanzani assures us, that the young, taken at the moment of their birth and nourished separately, reproduce without fecundation, like those of the *Aphis*. The males are nearly as common as the females; their generative organ is exerted and retracted, as in *Helix*, by a hole pierced in the right tentaculum, which causes this tentaculum to appear larger than the other. By this character the male is easily known."

The *vivipara* is far less common than the *decussata*, and seems to be more usually found in the southern part of the Union. Mr. Elliott of Charleston sent me two specimens from the banks of St. John's River, Florida, and Capt. Leconte presented me with one, which he obtained at Lake George on the same river. Pl. 10,¹ the two middle figures exhibit the brownish banded var. (*Say*.)

The next notice of the species was by Eaton, in 1826, who describes it as *Helix vivipara*.

In 1841 it is again described and figured by Haldeman, as identical with the European *Paludina vivipara*. The bands are spoken of as "several." Prof. Haldeman quotes *Pal. lineata* in the synonymy. (See that species).

The description of DeKay (1843) gives no additional information regarding the species, which is "extra-limital" to New York; it gives only four whorls and three bands to the shell.

In 1852, in the second edition of Chemnitz, this species is described and figured as *Paludina linearis*.

In the Proceedings of the Philadelphia Academy, 1862, p. 451, Mr. Tryon points out the fact of the American shell being invariably distinguished by the presence of four bands, yet refers it to *Pal. lineata*, Val., which derives its name from its being sometimes characterized by numerous revolving lines of green color instead of bands.

¹ One of the figures is given in my figure 48.

In 1863 Mr. Reeve refers the American form to *Paludina vivipara*, Lin.

Believing the species to be distinct from its European analogue, and not finding the description of Valenciennes to apply to it, I have been forced to adopt a new name, suggested by the resemblance of the shell to the *V. conlecta* of Europe.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8849	1	Cous River, Ala.	Dr. E. R. Showalter.	.....
8850	3	Lake Maxinkawka, Ind.	.....	.....
8851	4	Jacksonville, Fla.	W. G. Blaney.	.....
8852	4	Georgia.	J. Postell.	Cabaret series.
8853	2	Illinois.	.....	.....
8856	2	Mississippi River.	.....	.....
8860	3	Indiana	W. G. Blaney.	.....
8861	4	St. Clair River.	.....	.....
8911	1	.....	.....	.....
8911	1	Florida.	Prof. Agassiz.	.....
9202	1	Tascumbia, Ala.	Gen. Totten.	.....

Vivipara georgiana, LEA.—Shell scarcely rimate, elongately ovate, rather thick, smooth, lines of growth delicate; greenish horn-color,



Vivipara georgiana.

broken with darker longitudinal streaks and a few black ones showing the former peristomes, and whitish under the epidermis; sometimes of a rich brown color, pinkish without the epidermis, and varied with four revolving darker bands upon the body whorl, two of which only are visible above, and numerous irregularly crowded, narrow lines of the same color; spire



Vivipara georgiana.

elevated, composed of one entire and one partially truncated whorl, apex entirely removed; remaining whorls $4\frac{1}{2}$, regularly increasing, convex, the last bulging, more than one-half the shell's length, rarely rimate; aperture subcircular, very oblique, more than half the length of the body whorl, within uniformly white or dark horn-color, or plainly showing the revolving bands, which do not reach the edge; peristome edged with black, simple, acute, continuous, its columellar margin exerted, somewhat reflexed, leaving a narrow fissure, connected with the upper termination by a shining, dark, raised callus. Length of axis 20, greatest breadth of body whorl 21; length of aperture 15, breadth 14 mill.

The operculum is thin, horny, brown, concentric with sub-central nucleus.

Fig. 51.



Operculum of *V. georgiana*.

Paludina georgiana, LEA, Tr. Am. Phil. Soc. V, 116, pl. xix, fig. 85, date of title 1837; Obs. I, p. 228.—HALDEMAN, Mon. p. 23, pl. vii, f. 1, 2 (1841).—KÜSTER, in Chemn. ed. 2, p. 15, pl. iii, f. 7, 8 (1852).—DEKAY, N. Y. Moll. p. 86 (1843).—CHESU, Man. Conch. I, 310, fig. 2207 (Melantho); Illust. Conch. pl. I, f. 20, 21.—PHILIPPI, Conch. iii, 4, pl. I, f. 13 (1848).

Paludina wareana, SUTTERWORTH in KÜSTER, Chemn. ed. 2, 21, pl. iv, f. 10-11.—REVE, Con. Icon. 23 (1863).

Vivipara vivipara (part), W. G. BENNETT, proof-sheets of this work.

Inhabits Florida, Georgia, South Carolina, and Alabama.

Mr. Lea's description of this species will have to be considerably

Fig. 52.



Paludina georgiana.

modified to cover the various forms now known to exist; it was drawn from a specimen which was uniformly dark horn-colored. Specimens in the Smithsonian collection are thus characterized, while others are of an uniform pale greenish horn-color; others (Fig. 53) have a dark-green or brownish ground, varied with four broad brownish bands revolving on the body whorl, two only of which are discernible on the penultimate whorl; in others these bands are replaced by numerous revolving, unequal brown lines (Fig. 54). Those having the revolving lines have also bands which, as in the other cases, are plainly visible in the aperture of the shell. The bands do not reach the edge of the peritreme in the aperture; they are still discernible when the shell has lost its epidermis. As the peritreme rises to meet the base of the body whorl it is expanded and reflected, sometimes leaving a chink forming a false umbilicus—the shell being imperforate.

Fig. 53.



Vivipara georgiana.

I have not been able to trace any revolving microscopic lines upon the specimens I have examined.

No. 8854 of the collection was determined by Mr. Lea. His description is given below, and an outline of his original figure. Fig. 52 is copied from Haldeman's figure, which was drawn from the original specimen.

The other figures are from specimens in the collection.

Fig. 54.



Vivipara georgiana.

Paludina georgiana, Lea.—Shell ventricose-conical, thin, dark horn-colored, smooth; sutures very much impressed; whorls about five; convex; aperture nearly round, white.

Hopeton, near Darien, Ga. Prof. Shepard; my cabinet; cabinet of Prof. Shepard. Diameter .7, length 1.1 inch.

This species in form resembles most, perhaps, the *P. vivipara*. It is not quite so large, nor has it bands. It is rather more elevated, and the body whorl is smaller and rounder than the *P. decisa*, Say. The aperture at the base recedes more than is usual with the genus. (Lea.)

Fig. 55.

*Paludina georgiana*.

Vivipara georgiana is not a variable species in form. It bears somewhat the same relations to *V. contectoides*, as the European *V. vivipara* does to *V. contecta*. It is more constrictedly coiled upon its axis, its spire is more pyramidal in shape, its whorls are more flattened, and less angularly bulging at their upper portion. It is constantly truncated at the apex.

Reeve places *Pal. georgiana*, together with *vivipara*, Say, in the synonymy of the European *vivipara*, as I did in the proof-sheets of this work. The specimens since received have caused me to change my opinion.

An examination of an authentic specimen of *Pal. wareana* leaves no doubt in my mind of its identity with *V. georgiana*. The original description and a fac-simile of one of the original figures here follow:—

Paludina wareana.—Shell rimately perforate, ventricose, rather thin, subopaque, with delicate concentric lines, olivaceous-ferruginous, thickly streaked with smoke color; whorls 4, inflated, sutures deep; aperture oval, white, ends joined by a thin, glassy callus; peristome straight, sharp.

Fig. 56.

*Paludina wareana*.

Shell somewhat resembling *Pal. obtusa*, but is very truncated, rimate, perforate, ventricose, rather thin and transparent, almost opaque; striae fine; color olive green blending with iron; surface broken by numerous curved streaks, sometimes linear, sometimes stronger; whorls 4, slightly increasing; first whorl entirely eroded, the second slightly so in the shell examined; whorls ventricose, sutures moderate; aperture ovate, much shorter than the spire, above modified by the penultimate whorl, reddish within, bluish towards the edge; parietal wall covered with a thin transparent callus; columellar slightly curved; peristome straight,

acute, from below the middle to the base slightly curved. Length 9^m, breadth 7^m.

East Florida, in Lake Ware (Rugel). Coll. Charpentier (*Shuttleworth*).

The lingual membrane of *Vivipara georgiana* is figured below.

Fig. 57.



Lingual membrane of *Vivipara georgiana*. [STIMPSON.]

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8833	1	Georgia.	.....	.....
8834	3	"	.....	.....
8837	1	Alabama.	Acad. Nat. Sc.	.....
8838	2	Darien, Geo.	"	.....
8839	1	South Carolina.	"	.....
8842	1	.....	.....	Figured.
8822	1	Florida.	.....	"
8823	1	Georgia.	.....	"
8840	1	Florida.	L. Agassiz.	" [Figured.
8004	..	.....	"	Lingual of 8800.

***Vivipara lineata*, VALENCIENNES**—This species resembles that of the Selue. It is equally ventricose, but has a thinner shell. Shell ventricose-ovate, thin, diaphanous, with delicate transverse striae; greenish horn-color, with numerous transverse greener vittae. Whirls five, last one large, ventricose, and equalling in height one-half the entire length of the shell. Besides the striae of growth, there are numerous transverse, very fine lines. The whirls are not flattened towards the moderate suture. Apex acute. Color green, sometimes somewhat corneous ground, on which are a large number of bands of a deeper green and variable width, sometimes merely linear. On the upper whirls the bands are obsolete. Apex not eroded in any of a large number of individuals.

Operculum brown, thin, horny, covered with numerous concentric, not spiral, lines. Found in Lake Erie by M. A. Michaud, who found one shell full of young, as in the case of our species, which proves the species to be viviparous. There is reason to believe the other species also are so, though in the most natural genera species vary in being both oviparous and viviparous. The genera of colubers and vipers among the reptiles are an example of this, while the Mollusca furnish more numerous ones.

Length 1 inch 3 lines. (*Valenciennes*.)

Paludina lineata, VALENCIENNES, Reo. d'Obs. II, 256, 1833.

I have translated above the original description of Valenciennes. I have never seen any specimen to which it will apply, but have no doubt such will be found. At present it remains a doubtful species.

It is referred to *Pal. vivipara*, of Say, by several authors, but all the specimens of that species which I have seen are not characterized as *V. lineata* is described as being. (See remarks under *V. contectoides*.)

Vivipara troostiana, LEA—Shell ventriose-conical, thin, pellucid, yellowish horn-color, smooth, perforate; spire short; sutures very much impressed; whorls four, convex; aperture large, rounded, white.

Tennessee. Prof. Troost. My cabinet, and cabinet of Prof. Troost. Diam. .68, length .72 inch.

This is a subglobose species, differing from any which has come under my notice, in having the superior portion of the last whorl somewhat flattened, giving the shell a somewhat gibbous appearance. The operculum is rather of a light color, and the plane of the aperture is very retuse at its base. It has a strong resemblance to *P. unicolor* (Lamarck), and perhaps a stronger one to *P. Mahyana* (Grateloup). It is more depressed in the spire than either, and the perforation is smaller than in the former, while it is nearly the size of that in the latter. The aperture is larger than either. Dr. Grateloup has very properly, I think, separated the Malabar species from that which was observed by Olivier in Egypt, and called *unicolor* by Lamarck. The Egyptian shell has a larger perforation, is darker in color, and is a larger species. I call this after my friend Prof. Troost. (Lea.)

Fig. 58.



Vivipara troostiana.

Paludina troostiana, LEA, Tr. Am. Phil. Soc. IX, 14 (1844). Obs. IV, p. 14. Proc. II, 34 (1841). Arch. f. Nat. 1843, II, 130.

Paludina haleiana, LEA, l. c. X, 96, pl. ix, f. 58 (1847). Obs. IV, 70. Proc. IV, 167 (1845).

I have added to Mr. Lea's description of *V. troostiana* a view of the type (Fig. 58) in his collection. It will not seem to correspond very exactly with the figure of *haleiana*, of which a fac-simile is given below (fig. 59). A comparison of all of Mr. Lea's specimens of each has convinced me, however, of their identity. Mr. Lea's description of the latter species here follows.

Fig. 59.

*Paludina
haleiana.*

Paludina haleiana, LEA—Shell smooth, ventricosely conical, rather thin, reddish horn-color, imperforate; spire short; sutures much impressed; whorls four, nearly convex; aperture large, nearly round, bluish.

Diameter .4, length .55 inch. Alexandria, La.

This species is nearly allied to the *Pal. troostiana*, nob., but is rather smaller, of a darker color, not quite so rotund, and imperforate. These differences would distinguish it without difficulty. In the *haleiana* there is a disposition in most of the specimens to a compression below the sutures. This makes quite a shoulder at the sutures and prevents the mouth from being regular. (Lea.)

Vivipara coosaensis, LEA—Shell subglobose, thin, pale, rather smooth, perforate; spire short; sutures very much impressed; whorls five, round; aperture large, nearly round, within whitish.

Fig. 60.

*Vivipara coosa-
ensis.*

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith and Dr. Foreman. Diam. .58, length .62 inch.

This species is remarkable for its round whorls, its width and large deep sutures. The superior part of the whorls is somewhat flattened. The color is remarkably pale, nearly white. The epidermis is very thin, and under the lens displays very minute, rather regular longitudinal striae crossed on the body whorl by obsolete atria. The aperture is nearly one-half the length of the shell. (Lea.)

Paludina coosaensis, LEA, Tr. Am. Phil. Soc., IX, p. 23 (1844). Obs. IV,

23. Proc., II, 83 (1841).—RESER, Con. Icon. (Feb. 1863).

Paludina magnifica, parts., HALDEMAN, Mon., pt. 6, p. 4 of wrapper.

Mr. Lea's type of this species bears but little resemblance to *V. magnifica*, yet Prof. Haldeman unites the two. I myself have seen no connecting links between them, though I have examined numerous young individuals of *Viv. magnifica*.

Fig. 60 is drawn from the original specimen of Mr. Lea. No. 8949 of the Smithsonian collection was labelled by Mr. Lea.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8949	..	Alabama?	.....	Taste Lea. Cab. series.

TULOTOMA, HALDEMAN.

Soft parts of the animal, and lingual dentition unknown. Operculum with the nucleus simple. Shell thick, pointed-conic, imperforate; whorls flattened, nodulous, carinated, with a dark olivaceous epidermis; peristome thin, continuous.

Fig. 61.

Operculum of
Tulotoma
magnifica.

***Tulotoma magnifica*, CONRAD**—Shell subovate, ventricose, with two spiral bands of prominent tubercles on the body whorl, and one revolving near the base of each whorl of the spire; suture profoundly impressed, margined by an obtuse, subnodulous, prominent line; lines of growth very oblique and prominent; obscure spiral striae; epidermis olive; within bluish, often with purple bands.

A beautiful species when perfect, occurring in vast abundance on the masses of calcareous rock, which have fallen from the strata above into the Alabama River at Calhorne. I found it living only in such situations, and exclusively within a range of six or eight miles. In the Tombecbee or Black Warrior Rivers, I never observed a specimen of it, although I searched particularly for it on the rocks at St. Stephen's. (Conrad.)

Fig. 62.



Paludina magnifica, CONRAD, N. Fr. W. Shells, 1834,

p. 48, pl. viii, fig. 4; ed. CHENU, 23, pl. iv, f.

21.—DEKAY, N. Y. Moll. (1843), p. 86.—KÜSTER

in Chemn., ed. 2, 1852, p. 23, pl. v, figs. 3-6.—PHILIPPI, Conch.,

III, 1, pl. 1, figs. 1, 2 (1848).—MÜLLER, 1838, Syn. test. anno 1834,

promulg. 39.—REEVE, Cou. Icon. xx, f. 54 (1863).

Paludina magnifica.

Paludina bimontifera, LEA; Tr. Am. Phil. Soc., V, 58, pl. xix, fig. 71,

date of title, 1837.—In., Obs. I, 170.—DEKAY, N. Y. Moll. 87 (1843).

Paludina angulata, LEA; Tr. Am. Phil. Soc., IX, 22 (1844).—In., Obs. IV,

22. Proc. II, 83 (1841).

Tulotoma, HALDEMAN, Mon. I, Suppl. 2.

Operculum horny, subtriangular, with a lateral nucleus and concentric striae. A continuous elevated, heavy, revolving line sometimes takes the place of the nodules. The interior of the aperture varies from pure white to a rich dark purple; it is sometimes of a salmon color; the bands are also very variable in number and width. There are also sometimes dark-green

bands on the exterior of the shell. I have counted as many as four on the body whirl alone.

Fig. 63.



Operculum of
Paludina magnifica.

It is variable in size, and is generally much eroded at the apex. One specimen which I measured was 50 mill. long.

It inhabits Alabama and Georgia.

Fig. 62 is a facsimile of the outline of Conrad's figure of *Paludina magnifica*. I have added below figures of Mr. Lea's *Pal. bimonilifera* and *Pal. angulata*, which are, I believe, identical with this species, Fig. 66 being a facsimile of Mr. Lea's

Fig. 65.



Paludina magnifica,
young.

figure, and Fig. 67 being taken from a specimen determined by Mr. Lea. No. 8928 of the collection was labelled *Pal. angulata* by Mr. Lea. Haldeman agrees with me in considering this last identical with *T. magnifica*. I am indebted to Dr. E. R. Showalter for the other specimen figured. Haldeman adds *Pal. coosaensis* to the synonymy.

Paludina bimonilifera, LEA.—Shell obtusely turreted, dark horn-color; apex obtuse; whorls furnished with two rows of nodules; the nodules of the lower row of the upper whorls hidden by the suture, those of the upper row larger, and visible on all the whorls; sutures deep and irregular; nuter lip sub-biaugular; base sub-angular.

Alabama River (Judge Tait). My cabinet and those of Prof. Vannxem, Am. Phil. Soc., Ac. Nat. Sc. Phila., P. H. Nicklin, Baron Ferussac. Diam. 1.1, length 1.8 inches.

This superb *Paludina*, which far surpasses in point of beauty any of our species yet known, I owe to the kindness of Judge Tait. Its beautiful double tuberculated cincture at once distinguishes it from all described species. Some specimens are furnished with dark purple bands which beautifully decorate the interior of the shell, and give a dark rich green color to its fine epidermis. In the others these are wanting, and the epidermis then has a clear and more yellow appearance. The sutures being

Fig. 64.



Paludina magnifica.

Fig. 66.



Paludina bimonilifera.

formed immediately over the lower row of tubercles, they cause its line to be very irregular; and this row itself is hidden on the upper whorls. (*Lea*.)

Paludina angulata, *Lea*.—Shell inflated, thin, brown, above somewhat varicose, below transversely and minutely striate, minutely perforate; spire rather short, dark at the apex; sutures impressed; whorls five, angular in the middle; aperture large, subtriangular, within subnigrous.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, Dr. Foreman, T. G. Lea, and J. Clark. Diam. .80, length 1.05 inch.

This is a very distinct species, being more angular than any I have seen. In the specimen before me, there are three irregular transverse impressions, two above the angle, and one immediately below. The striae are more distinct on the lower half of the whorl. The first three whorls are very dark. The aperture is nearly one-half the length of the shell, and quite angular at the base.

Since the above was written, I have received more mature and perfect specimens. They differ from the one described in being darker in the epidermis, and in having four purple broad bands, which are very distinct within the aperture. In these specimens, there is a series of indistinct tubercles above the periphery of the last whorl. (*Lea*.)

Fig. 67.

*Paludina angulata*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8927	1	Alabama.	.....	Texas T. A. Conrad.
9017	1	"	L. Lea.	Cabinet series.
9028	5	"	.....	(<i>P. angulata</i>); Figure
9120	20+	Coosa River.	.....	ed in Fig. 67.
9196	2	Alabama River.	Dr. Showalter.	<i>angulata</i> var. <i>Lea</i> .
				..... [Cab. ser.
			

MELANTHO, BOWDITCH.

Fig. 68.

*Melantho decisa* (female).

Foot large, rather thin, broad, much produced beyond the snout, and slightly auricled in front. Colors rather light, in reddish spots on a palish white ground. Head of moderate size. Snout small. Lingual teeth smooth, or only very mi-

Fig. 69.

Lingual dentition of *M. integra*

nately crenulated at their apices. Cervical lappets of moderate size, but not forming regular tubular aquiferous ducts; the right one plicated. Branchial lamina elongate-triangular, equal in size, and arranged in a single straight row both at base and tips. (*Stimpson*.) Operculum with the nucleus simple.

Fig. 70.

Operculum of
M. doctea.

Shell thick, solid, ovate, imperforate, spire produced; whorls rounded, smooth, covered with an olivaceous epidermis; peristome simple, continuous.

Melantho ponderosa, SAY—Shell imperforate, globosely-ovate,

Fig. 71.

*Melantho ponderosa*.

very thick and heavy, smooth surface hardly broken by the wrinkles and delicate striae of growth, often also with delicate revolving striae; greenish horn-color, with irregularly disposed dark streaks, marking the edges of former peristomes, milky white under the epidermis; spire short, conic, apex perfect, convex; whorls 5 or 6, very rapidly increasing in length, convex, the body whorl very large, equalling four-fifths the shell's length, imperforate; aperture oval, narrowed above, slightly oblique, equalling almost one-half the shell's length, within white, shining; peristome margined externally with darker color, simple, acute, extremely sinuous, in its first half rectilinear, then produced forward and rounded, then retreating rapidly and curving inwards and downwards, thence upwards to the base of the aperture,

its columellar portion very much thickened, sometimes exerted sufficiently to leave a narrow fissure, connected with the upper terminus by a very thick and solid callus, which enters beyond sight within the aperture, and at the upper portion is produced into a prominent Lithasia-like thickening, between which and the peristome is a deep sinus. Length of the axis 33, greatest breadth of body whorl 27; length of aperture 28, greatest breadth 19 mill.

Operculum elongate-ovate, narrow above, convex, margin thin, horny, concentric, nucleus near the columella.

Paludina ponderosa, SAY, 1821, J. A. N. S. II, 173; Am. Conch. III, pl. xxx, f. 1 (1831); ed. BISKUP, p. 68, 184, pl. xxx, f. 1; ed. CHENG, 41, pl. xi, f. 5.—HALLOWMAN, Mon. p. 13, pl. iv (1840).—DE KAY, N. Y. Moll. p. 86 (1843) (excl. syn. *heterostrophæ*).—DESHAYES in LAM. ed. 2, VIII, p. 516 (1838); ed. 3, III, p. 453, excl. *P. decisa*.—KUSTER in Chemnitz, ed. 2, p. 14, pl. lii, f. 1-4, p. 20, pl. iv, fig. 6.—

- SOWERBY, Gen. of Shells, f. 2.—CHENE, Man. de Conch. I, 310, fig. 2206 (Melantho); Illust. Conch. pl. I, f. 14-15; Lea, Elem. d'Hist. Nat. p. 171, f. 559, 560 (1847).—PHILIPPI, Conch. III, 3, pl. I, f. 6 (1848).
Ampullaria crassa, DESHAYES, Encycl. Méth. II, 32 (1830).
Paludina crassa, SAY of DESHAYES l. c.
Paludina decisa (part), REEVE, Con. Icon. f. 45 b.
Paludina regularis, LEA, Tr. Amer. Phil. Soc. IX, 13 (1844); Obs. IV, 13; Proc. II, 34 (1841); Arch. f. Nat. II, 139 (1843).—REEVE, Con. Icon. pl. xi, f. 69 (1863).

I have received specimens from Ohio, Indiana, Illinois, Michigan near Lake Superior, Tennessee, and Alabama.

There are microscopic revolving lines upon the whorls of many specimens, and the callosity at the superior angle of the aperture is sometimes developed sufficiently to make quite a fissure between it and the lip, as in *Lithasia*. This is an important feature which serves to distinguish it from the allied species, as does also the highly developed curvature of the peristome (see Fig. 71), the extreme thickness of the shell, the heavy, deeply

entering callus on the parietal wall of the aperture, the shorter spire, and more globose outline of the shell. It appears to me a distinct species, readily distinguished from *M. decisa* and *M. integra*, in early stages of growth as well as when mature—the young shells being very much more globose than the young of those species.



From the Coosa River, in Alabama, Dr. Showalter has sent numerous specimens of this species, which were formerly noticed by Prof. Halde-

man as var. a. They are extremely solid, have the callosity of the upper portion of the aperture highly developed, are constantly truncated in the early as well as later stages of growth, and when mature are very much eroded even upon the body whorl. They have the usual features of *M. ponderosa*—



the sinuous peritreme, the revolving striae, the short spire, the heavy callus upon the parietal wall of the aperture. Some of them are figured in Fig. 72 to 75.

I give below the original description of Mr. Say, and a facsimile of one of his figures (Fig. 76). The shell figured as *Pal. decisa* in the American Conchology may, perhaps, be a form of *M. ponderosa*. (See Fig. 84.)

Paludina ponderosa, SAY.—Shell somewhat ventricose, much thickened, olivaceous or blackish; spire not much elongated, much shorter than the aperture, eroded at tip, but not truncated; whorls five, slightly wrinkled across; suture profoundly impressed; aperture subovate, more than half the length of the shell; labium with much calcareous deposit, and thickened into a callosity at the superior angle; within tinged with blue.

Inhabits Ohio River.

Greatest length, one inch and 11-20. Transverse diameter one inch and 1-10.

This shell is common at the falls of the Ohio, and is a very remarkably thick and ponderous species. It bears a striking resemblance to *P. decisa*, and has, without doubt, been generally considered as the same; but it differs from that species in being much more incrassated and heavy; and although much

decorated and eroded upon the spire, the tip is not truncated. In the labrum also is a distinctive character; by comparison this part will be perceived to be less arcuated in its superior limb than the corresponding part in *decisa*.

This shell is common in many parts of the Ohio as well as its tributaries. In its full grown state it is very thick and ponderous, enlarging so much in its body whorl, as to appear very different from the young shell. In the early stages of growth it resembles *P. decisa*, Nobis, from which indeed the back view would hardly distinguish it; but a sufficiently distinctive character resides in the lower part of the labium, which in the *decisa* is not obviously produced, whereas in the present species it is considerably advanced, as in many species of *Melania*, to which genus it is closely allied. (Say.)

I have no doubt that a young specimen of *Melantho ponderosa* is the type of *Paludina regularis*, Lea. My figure is drawn from a specimen determined by him, and now deposited in the collection of the Smithsonian Institution (No. 9016). The spire

Fig. 76.



Paludina ponderosa.

is extremely short, flattened, but well defined quite to the acute apex; the sutures are impressed; the body whirl comprises more than five-sixths of the complete length of the shell; the aperture is almost as long as the body whirl, and so wide that the length and breadth of the shell are almost equal; the shell is remarkably globose, almost circular. I have often met in cabinets with immature specimens of *Vie. ponderosa* under this name. No. 8925 were also labelled *regularis* by Mr. Lea. His description here follows. The shell figured under this name by Reeve appears to me a young *M. ponderosa*.

Fig. 77.

*Paludina regularis.*

Paludina regularis, LEA.—Shell subglobose, rather thick, greenish horn color, imperforate; spire very short; sutures impressed; whorls five, convex; aperture large, ovate, within bluish.

Ohio? T. G. Lea. My cabinet, and cabinet of T. G. Lea. Diam. .38, length .52 inch.

A very distinct species with the body whirl about four-fifths the length of the shell. The whorls are very regular, giving the spire somewhat the appearance of a coil of rope. All the specimens before me are more or less incrustated with the oxide of iron. The aperture is inflated, and about three-fourths the length of the shell.

I am not positively sure that this species came from Ohio. By some accident the label has been misplaced, but I am under the impression it came with some other species from my brother at Cincinnati. (Lea.)

Ampullaria crassa, of Deshayes, is a synonym of this species, as will be seen by the translation given below of Deshayes' description. He quotes erroneously *Paludina crassa*, of Say, for the species—Mr. Say never having published this name. An examination of the animal has, moreover, shown it to belong to the genus *Melantho*. Fig. 78 is taken from a drawing of the animal by Mrs. Say, which Prof. Haldeman furnished me.

Fig. 78.

Animal of *Melantho ponderosa*.

Ampullaria crassa.—Shell ovate-elongate, acute, thick, solid, under the epidermis brownish; very white; transversely substriate; whorls 6, con-

vex, scalariform, separated by a deep and channelled suture; sperture ovate acute, expanded at base, very white within, and with a small umbilicus.

Paludina crassa, SAY.

We do not agree with Mr. Say in placing this shell among the *Paludina*: it has not their essential characters, excepting the lengthening of the spire. In other respects it is more nearly allied to the *Ampullaria*, its form and thickness particularly approaching some of the fossil species of the environs of Paris described below.

This shell is oval, elongated, acute at the summit, rounded at base, thick, solid, heavy, covered with a brownish, sometimes greenish very thin epidermis, below which the shell is of an uniform milky white puresness. The spire is elongated, conic, scalariform, formed by six convex whorls, deeply separated by a canalculated suture, and, in perfect specimens, marked with delicate transverse striae. The aperture is moderate, not oblique to the shell's axis or rounded or with a continuous peritreme like *Paludina*, but oval, narrowed above where it also is angular as in most *Ampullaria*, enlarged below, where it forms a large, not deep sinus, in this point also resembling *Ampullaria*, but differing from all *Paludina*; lastly, the right lip is slightly reflected (reouvrant), which is also characteristic of the genus in which we have placed it. Right lip acute, quickly thickening but with no rim within, sinuose, especially at base, when viewed in profile; left lip thickened, especially towards the posterior angle of the aperture, and obliquely appressed so as to blend with the columella which is rounded, thick, and reflected, with a small umbilical opening behind it. This shell comes from the Ohio and most of the North American rivers. Length from 45 to 50 mill. (*Deshayes*.)

Reeve, *l. c.*, places *Paludina ponderosa* in the synonymy of *Pal. decisa*. It is, indeed, difficult to draw the line between the two.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8841	8	Cosca River, Ala.	W. G. Blaney.	.....
8842	1	" "	"	.....
8843	2	" "	"	.....
8848	3	Ohio.	Acad. Nat. Sc.	Cab. series.
9132	2	Alabama.	"	.....
9132	9	Cosca River, Ala.	Showalter.	.....
9333	12	" "	"	.....
9325	8	Illinois.	"	regularis, teste Lea.
9326	4	"	L. Lea.	" [Cab. ser.
9016	1	.....	.....	.....

Melantho decisa, SAY.—Shell imperforate, elongate-ovate, rather

Fig. 79.

*Melantho decisa*.

thick, smooth, surface hardly broken by lines of growth, with microscopic revolving striae; greenish, with irregularly disposed brown streaks marking the edge of former peristomes, uniformly chalky white under the epidermis; spire truncated, one or two whorls of it alone remaining, apex entirely removed; remaining whorls $3\frac{1}{2}$, convex, the last equalling two-thirds of the shell's length, imperforate; aperture oval, oblique, more than one-half

Fig. 80.

*Melantho decisa*.

the length of the last whirl, bluish-white within;

peristome externally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin callus on the parietal wall, entering within the aperture. Length of axis 37, greatest breadth of body whorl 17; length of aperture 16, breadth 11 mill.

Fig. 81.

*Melantho decisa*.

Operculum arcuated, convex, horny, concentric, nucleus nearer the columellar margin.

Fig. 82.

Operculum
of *Melantho*
decisa.

Limnæa decisa, SAY, NICH. EN. ED. I, 1817; ED. 2, 1818, pl. iii, f. 6.

Paludina decisa, SAY, 1817, NICHOLSON'S ENCYCL. pl. iii, f. 6 (*Limnæa* of earlier

editions); AMER. CONCH. I, pl. x (1830); ED. BIRNEY, p. 49, 159, pl. x, fig. 1, pl. lxx, fig. 6; ED. CHENU, 16, pl. ii, f. 5.—PHILIPPI, CONCH. III, 3, pl. i, f. 8 (1848).—HALDEMAN, MON. p. 4, pl. i (1840).—GOULD, INVERT. OF MASS. 227, wood-cut, p. 144 (1841).—ADAMS, IN THOMPSON'S HIST. OF VERMONT, p. 151, fig. (1842).—DEKAY, N. Y. MOLL. p. 84, pl. vi, f. 131; vii, 134 (1843).—CHENU, III. CONCH. i, f. 1-5.—MRS. GRAY, FIG. MOLL. AN. pl. cock, f. 10.—POTIER ET MICHAUD, GALL. DES MOLL. I, 247, pl. xxv, f. 13, 14.—KÜSTER IN CHEMN. ED. 2, p. 13, pl. ii, fig. 14-19.—REEVE, CON. ICON. 45, a, c, d, excl. 45 b (= *Pal. ponderosa*), MAR. 1863.

Melania ocularis, MENKE, SYN. METH. p. 134, teste KÜSTER.

Paludina limosa, VALENCIENNES, REC. D'OBS. II, p. 253, 1833, teste KÜSTER AND HALDEMAN.

Paludina ponderosa JEN., DESHAYES IN LAM. VIII, 516 (1838), ED. 3, III, 455.

Paludina heterostropha, KIRTLAND, OHIO REP. p. 175 (1838).—TAPPAN, AM. JOURN. SC. [1], XXXV, p. 269, pl. iii, p. 2, 1839.

Paludina microstoma, KIRTLAND, OHIO REPORT, p. 175 (1838).

Paludina rufa, HALDEMAN, MON. III, p. 3 of wrapper, pl. iii, f. 1 (1841).

- Paludina cornea*, VALENCIENNES? *Rec. d'Obs.* II, 255, 1833.
Paludina integra, SAY, 1821, BUNNET'S ed. p. 69; *JOURN. A. N. So.* II, 174 (1821).—HALDEMAN, *MOB.* p. 10, pl. III (1840).—ADAMS, in *Thomp. Vermont*, p. 152 (1842).—DEKAY, *N. Y. Moll.* p. 84, pl. VII, f. 132 (1843).—KÜSTER, *Chemn.* ed. 2, p. 17, tab. III, f. 11-13.—CHENU, *Ill. Conch.* pl. I, f. 9-13.—PHILIPPI, *Conch.* III, 4, pl. I, f. 7 (1848).
Paludina genicula, CONRAD, *N. Fr. W. Shells*, p. 48, pl. VIII, fig. 3, 1834; ed. CHENU, 23, pl. IV, f. 20.—KÜSTER in *Chemn.* ed. 2, p. 14, pl. III, fig. 5, 6 (1852).—MÜLLER, *Syn. Test.* in 1834 prom. p. 39.—HALDEMAN, *MOB.* p. 15, pl. V (1840).—DEKAY, *N. Y. Moll.* p. 86 (1843).—CHENU, *Illust. Conch.* pl. I, f. 18-19.
Paludina heros, DEKAY, *olim*, *N. Y. Prel. Rep.* 1839, p. 32; *Moll.* p. 85 (1843).
Paludina subulida, ANTHONY, *Proc. A. N. S. Phila.* 1860, p. 71.—TAYLOR, *Phil. Fr.* 1862, 452.
Paludina decapitata, ANTHONY, *Proc. A. N. S. Phila.* 1860, p. 71.—REEVES, *Con. Icon.* pl. XI, f. 75 (1863).
Paludina milesii, LEA, *Proc. Phila. Acad. Nat. Sc.* 1863, 156.
Helix dissimilis, WOOD, *Ind. Suppl.* pl. VII, f. 18 (1828); HANLEY'S ed. p. 226 (1856).
Helix decisa, EATON, *Zool. Text-Book*, 196 (1828).
Lymsula ventricosa, RAFINESQUE, MSS.
Ambloxis (Amblostoma) major, RAFINESQUE, MSS.
Cochlea Virginiana, &c., LISTER, *Conch. t. cxxvii*, f. 27 (1770).
 PETIVER, *Gazophyl.* t. cxvi, f. 18.

Found in all eastern North America, from the Rio Grande to Nova Scotia and the Canadas.

The first point to be decided in considering this species is what shell Mr. Say had before him in drawing up the description of *Limnæa decisa*, which name was subsequently changed to *Paludina decisa*. It is from the original description and figure alone that this point can be decided. They are both copied below, as given in the American edition of Nicholson's Encyclopedia.

Limnæa decisa, SAY.—Shell subconic, olivaceous, truncated at the apex; whorls four, wrinkled across and banded with minute distant striae; terminal whorl very short; suture impressed and conspicuous; aperture subovate, more than half of the length of the shell, entire; within bluish-white. Operculum coriaceous, elevated on the disk and concentrically striated. Length one inch, breadth three-fourths.

Fig. 83.



Limnæa decisa.

Cochlea virginiana & *flava viridescens*, non fasciata.
 LISTER, *Conch.* tab. cxxvii, fig. 27.

The young shell resembles *P. subcarinata*, but the whorls

are destitute of an elevated line, the suture is not so deeply impressed, and the aperture is narrower above.

Animal with the foot larger, suddenly a little dilated each side before and truncate in front, widely; foot livid, thickly maculated with irregular orange spots, which are much smaller beneath; head and tentacula spotted with orange; eyes on a prominent angle, at the external base of the tentacula.

I found the animal viviparous in October; the young shell had then three complete whirls, which were spirally striated. (Say.)

In the above description no locality is given, but there can be no doubt that the shell described is the form common in the Delaware River. I have, therefore, taken this form to be the type of the species. From one of these my description and figures 79 and 81 are drawn. Younger specimens are proportionally more globose than the one figured, and the spire is often not truncated, but consisting of 5 whirls, the apex being perfect. Fig. 80 is drawn from a specimen found in the Susquehanna, more elongated in shape, and truncated at the apex alone. In New England and Canada the shell is less elongated, with more pyramidal spire.

Say figured another shell as *Paludina decisa* in the American Conchology, and gave two figures of it, from one of which my figure 84 is copied. At this time he repeated the description from the Encyclopedia, and added the following remarks and references.

This species is common in various parts of the Union. Dillwyn informs us that Müller and others have incorrectly quoted Lister's figure for their *Helix angularis*. Petiver, Gaz., pl. 106, fig. 18. (Say.)

The figure copied above does not agree with that given in Nicholson's Encyclopedia. I

Fig. 85.

*Helix dissimilis*.

should rather refer it to *Melantho ponderosa* (page 37).

To the typical form of *M. decisa* the following synonyms may without doubt be referred.

Figure 85 is a fac-simile of *Helix dissimilis*, Wood, of which no description nor locality is given. It is evidently intended for this species, though the true name *decisa* is

Fig. 84.

*Paludina decisa*.

Fig. 86.

*Cochlea, &c., Listera*.

applied by Wood to a figure of *subcarinata*. I also give a facsimile (fig. 86) of Lister's figure.

Paludina heterostropha of Kirtland's Ohio Report is referred by Gould (Boston Proc. I, 32) to *Mel. ponderosa*. Judging from the figure given of it by Tappan, I would rather refer it to *decisa*. It is so considered by Reeve. This figure is copied in my fig. 87, while the description furnished Tappan by Dr. Kirtland is as follows:—

Paludina heterostropha, KIRTLAND, I. O.—Sinistral; aperture more than half the length of the shell. Shell subglobose, ovate; spire depressed, apex generally truncate; whorls 5; aperture ovate, with its superior extremity curved towards the body whorl, within bluish-white; epidermis greenish horn color, usually coated with ferruginous clay. Length $\frac{3}{4}$ inch.

Fig. 87.



*Paludina
heterostropha.*

This shell frequently occurs in Mill and Yellow Creeks, tributaries of the Mahoning River. I formerly considered it a mere variety of *P. decisa*, Say; but on further examination found it to be specifically distinct. It never attains more than half the length of that species; its spire is never depressed, and it is always heterostrophal. (Tappan.)

To the copy of the description of *Paludina decapitata*, of Mr. Authouy, given below, I am able to add Fig. 88, drawn from the type, which he kindly loaned me for the purpose. I do not consider this a well-established species. The single specimen on which it is founded is evidently an undeveloped specimen in a very imperfect state. The spire is eroded, the shell presents the appearance of belonging to a small ill-favored individual of *M. decisa*. However, the only information we have regarding it, given below, may serve to identify it, should it appear in future.

Paludina decapitata, AUTHOY.—Shell globular, thin, of a light green color; spire truncate, but never elevated under any circumstances, composed of about four very flat whorls; aperture broad, ovate, one-half the length of the shell, within dusky white; columella regularly but not deeply rounded, with a slight deposit of callos, and having a very small linear umbilicus at base.

Fig. 88.



*Paludina
decapitata.*

Tennessee. My Cabinet.

A single specimen only is before me, and therefore I claim it as a new species with some hesitation; it seems to me, however, too unlike any of the ordinary forms in this genus to warrant its being included with any of them; it is the most globose of any species hitherto published, if we except the small, round forms which were long since removed, and very properly too, to

Amnicola; the spire is entirely wanting, but traces of the sutures show the number of whirls; and its present appearance forbids the idea of its ever having had an elevated spire. (Anthony.)

The fac-simile which I have given of Haldeman's figure, drawn from the original specimen of *Paludina genicula*, Conrad (Fig. 89), would lead one to consider that species identical with *Viv. decisa*. I do not, therefore, hesitate to unite them; my opinion is founded on an examination of a series of shells from the locality which furnished Mr. Conrad's specimen, which show a gradual series from the rounded whirls of the *decisa* to the angular form of *genicula*, though none of the shells were as well marked as that figured. From other localities, also, I have received specimens of *decisa* whose six whirls were quite as angular and scalariform. I suppose Higgins refers to some such in quoting *Pal. genicula* from the Ohio and Scioto Canal (Cat. 6). In Küster's *Paludina* (Chemu. ed. 2), Cedar Creek is also given as a locality for *genicula*. Mr. Conrad's description is as follows. Fig. 90 is a fac-simile of his. It is considered identical with *decisa* by Reeve.

Fig. 90.

*Paludina genicula*.

Paludina genicula.—Shell suboval, spire slightly elevated; volutions 4, scalariform, shoulders angulated; apex eroded, aperture rather more than half the length of the shell; epidermis green olive; within bluish.

A species which is readily distinguished from those nearest allied to it by the angulated whorls. I found a single specimen in Flint River, Ga. (Conrad.)

Lymanella ventricosa, Rafinesque, of whose description and figure (fig. 91) a copy is here given, is evidently this species. His figure, though very rough, is quite characteristic.

Fig. 91.

*Lymanella ventricosa*.

Lymanella ventricosa.—Whorls 4, last one very large; form obtuse-oval; aperture bluntly oval, &c. (Rafinesque.)

From the same MS., "Conchologia Ohioensis," which was presented to the Smithsonian Inst. by Prof.

Fig. 89.

*Paludina genicula*.

Fig. 92.

*Lymanella ventricosa*, Raf.

Haldeman, I find rough figures (fig. 92) of *M. decisa* under the name of *Amblosia*, *Amblostoma*, or *Lymnulus major*, Rafinesque, or *Lymnea eburnea*, Rafinesque. All these names are given, and I find it impossible to decide which was the one finally fixed upon, or to decipher more of the description than the following:—

Whirls 5, last very large, form obtuse oval, aperture obtuse oval, lip thickened within, columella covered with callus. (*Rafinesque*.)

I put *Melania ocularis*, Mke., in the synonymy on the authority of Küster (Chemn. ed. nov.), who so quotes it. I have seen no authentic specimen, but cannot doubt its identity with *M. decisa*.

Melania ocularis, MENKE, (l. c.)—Shell ovate-conoid, truncate, substriate, shining, greenish, reddish-brown when old, truncated at apex; aperture ovate, columella subcallous above; aperture rounded before.

Length 1 inch; breadth 7 lines.

Hab.—Near Cincinnati, in the Ohio River. Bescke. (*Menke*.)

Paludina limosa, Valenciennes, is considered a synonym of *M. decisa* by Haldeman and Küster. I have seen no authentic specimen. It is also considered a synonym by Reeve, l. c.

Paludina limosa, VALENCIENNES (l. c.)—Shell ovate-conic, thin, subdiaphanous, green; whirls 5, longitudinally striate; labrum acute.

Paludina limosa, SAY, Journ. Phil. 1, 125.

This *Paludina* is less globose and longer than that of our climate. The height at the last whirl is a little less than of the others. Its breadth is greater than its length, and its surface is covered with somewhat strong longitudinal striae. The form of the aperture is also more oval. Its vertical diameter is the longest.

The lip is sharp, continued to the columella, which is not appressed.

The shell is not very thick; there are, however, some individuals which are eroded like some of the bivalve shells.

The apex is destroyed as the animal grows, and a flat circular partition is formed, having the axis of the shell in its centre, in about the same manner as in *Dulinea decollatus*.

I saw one individual whose three apical whirls were destroyed so as to give a broken appearance to the shell.

Length rather more than one inch. (*Valenciennes*.)

The following also is cited as a synonym of *M. decisa* by Reeve. Judging from the description I should so consider it.

Paludina cornea, VALENCIENNES (l. c.)—In the Delaware and many other rivers of the United States there is found a horn-colored *Paludina*, which at first sight resembles the *Pal. limosa*, but which a more careful examina-

tion proves to be sufficiently distinct to form a new species. On account of its color I call it

Paludina cornea.—Shell ovate-conic, thin, opaque, greenish horn color; whirls 5, subrounded; sutures deeply impressed.

This species has an obtuse apex; the last whirl is one-third longer than the others; each of them has a kind of flattening (aplatissement) which forms a balustrade (rampe) around the spire, whose sutures are deeply impressed. The striae of growth are vertical and fine. The aperture is oval. Horn colored, with a greenish tinge; the interior of the mouth and lip is white.

The largest individual was 11 lines in length. (*Valenciennes*.)

Figure 93 represents a deformed specimen of *Melantho decisa*, from the Susquehanna. It is introduced here for the purpose of showing how abnormal an individual of a species may be.

Another abnormal form of *Melantho decisa*, in which the whirls are more numerous and tapering, which is often met with in any large number of specimens, has been described as a distinct species as *Paludina milesii*. The original description is given below, as well as a figure of one of the original specimens, presented by Prof. Miles.

Fig. 93.

*Melantho decisa*, deformed.

Fig. 94.

*Paludina milesii*.

Paludina milesii.—Shell smooth, subpyramidal, sub-solid, imperforate; spire lengthened; sutures deeply impressed; whirls 6, subindented; aperture somewhat small, subovate; labrum acute, somewhat sinuose; columella somewhat thickened both above and below.

Branch Lake, Autrim Co., Michigan. M. Miles. (*Lea*.)

No. 8921-4 of the collection were presented by Dr. James Lewis under the unpublished name of *Paludina obesa*, Lewis.

Fig. 95 represents one of them. This form is a well marked variety, found near Mohawk, N. Y., in Ohio, and Michigan. It is readily distinguished by its very ventricose, rounded form and dark olive green color. Its name is preoccupied.

It is customary, in collections, to separate the more elongated forms of *Melantho decisa* under the name of *M. integra*. It becomes necessary, therefore, to ascertain what shell Mr. Say had before him in drawing up the description of *Palu-*

Fig. 95.

*Paludina obesa*.

dina integra. I have, therefore, copied below his description, and given a figure (96) of his typical specimen still preserved in the collection of the Philadelphia Academy.

Paludina integra, SAY.—Shell olivaceous, pale, conic; whorls six, wrinkled across; spire rather elongated, entire at the apex; suture profoundly indented; aperture subovate, less than half of the length of the shell.

Fig. 96.

*Paludina integra*.

Inhabits the waters of the Missouri. Length $\frac{1}{2}$ inch.

Very much resembles *P. decisa*; the spire, however, is more elongated, and never truncated at the apex, but always acute. (Say.)

The dimensions given above are probably a typographical error.

The large number of specimens which I have had the opportunity of examining have exhibited so many and so slight degrees of difference between *M. decisa* and *M. integra*, that I am persuaded of their specific identity. I am supported in this view by the recent monograph of Mr. Reeve, but opposed in it by most of the American collectors. I have given below a description and figure of what is usually acknowledged to be *Paludina integra*. The difference of form of the sexes is shown also, Fig. 98 being male, Fig. 97 being female.

Melantho decisa, var. *integra*.—Shell imperforate, elongate-ovate, quite thick, smooth, surface hardly broken by lines or wrinkles of growth,

Fig. 97.

Female of *M. decisa*,
var. *integra*.

Fig. 98.

Male of *M. decisa*,
var. *integra*.

marked with delicate revolving striae; greenish, with darker streaks, marking the edge of former peristomes, uniformly chalky white under the epidermis; spire elongated-conic, apex perfect, acute; whorls 5, convex, the last equalling two-thirds the shell's length, imperforate; aperture oval, narrowed above, oblique, more than half the length of the body whorl, milky white within; peristome ex-

ternally of a darker color, simple, acute, somewhat sinuous, its terminations joined by a thin, transparent callus on the parietal wall of the aperture,

more heavily thickened and white above and below. Length of axis 24, greatest breadth of body whorl 15; length of aperture 15, breadth 11 mill. Operculum as in *M. decisa*.

In general terms it may be said that the form known as *M. integra* differs from *M. decisa* by being more elongated, having a perfect apex, a smaller aperture, more prominent revolving striae, and a whiter aperture. These characters are only comparative. The two forms are not distinguished by any decided, constant, specific characters. Fig. 99 represents young shells, which are more globose, comparatively, than the more mature ones.

Fig. 99.

Young of *M. integra*.

Fig. 100.

*M. integra*, deformed.

Two curiously deformed specimens of *M. integra* in the collection are figured in Figs. 100 and 101.

Reeve places *Paludina ponderosa* in the synonymy of *Pal. decisa*. On page 37 will be found an enumeration of the constant specific characters of *Melanthis ponderosa*.

Paludina microstoma, Kirtland, is added to the synonymy on authority of Mr. Anthony, who tells me Prof. Kirtland described it before meeting with the description of *integra*. On seeing Mr. Anthony's cabinet he was at once convinced of their identity.

Paludina microstoma, l. c.—An undescribed species of *Paludina*, found frequently associated with the *P. decisa*, and distinguished by its elongated spire and small mouth. (Kirtland.)

Paludina rufa, Haldeman, is said by him (l. c.) to be distinguished by a reddish color and entire apex, but may be a variety of *Pal. decisa*. The reddish or pinkish tint within the aperture (sometimes divided into bands) appears to distinguish this form of the species, which occurs in the Southern as well as Northern States. Prof. Haldeman's original specimen of *Pal. rufa*, together with all those from which

Fig. 101.

*M. integra*, deformed.

Fig. 102.

*Paludina rufa*.

the plates of his Monograph were drawn, are deposited by him in the collection of the Academy at Philadelphia. Fig. 102 is a facsimile of the figure referred to by Haldeman under this name. No. 8905 of the collection represents it. This variety is represented by eight of the lots catalogued below in the museum register. One of them has the spire truncated, the surface very much eroded, a more globose form, and more sinuous peritreme than usual (see Fig. 103). The whole shell under the epidermis appears of a rosy hue.

Paludina subsolidata, Anthony, appears to me also a synonym of this species. My opinion is founded on an examination of Mr. Anthony's specimen, kindly lent me for figuring (Fig. 104). It is also so considered by Reeve. No. 9311 was presented to the collection under this name by Mr. Anthony. His description here follows.

Paludina subsolidata, ANTHONY.—Shell ovate, imperforate, very thick; color light green, verging to brown in old specimens; spire much elevated, composed of 6—7 inflated whorls; sutures very distinct; aperture broad-ovate, about one-third the length of the shell, within white; lip curved forward and forming a very conspicuous, subacute tip near its base; columella well rounded, a thick callous deposit covering the umbilicus. Length 2 inches, breadth 1½ inches.

Illinois. My cabinet; cabinet of Hugh Cuming, London.

This is the most ponderous species in the genus, far exceeding *P. ponderosa*, Say, in that respect; compared with that species it is not only much more solid and heavy, but its spire is proportionally more elongate, whorls more convex, while the body whorl is less ventricose, and the aperture is uncommonly small for a *Paludina* of its size; the body whorl is disposed to be angulated near its middle; all the whorls are more or less shouldered and the lines of growth are very conspicuous; the body whorl is obscurely striate concentrically, and its surface thereby modified so as to present a faintly sculptured appearance, and the striae being somewhat finely undulated the appearance under a microscope is very pleasing. (Anthony.)

Fig. 103.

*M. integra*, var. *rufa*.

Fig. 104.

*Paludina subsolidata*.

Paludina heros, DeKay, of one of the earlier Zoological Reports of New York is said by that author to be a large form of *Pal. integra*. (N. Y. Moll. p. 85.)

Fig. 105 represents the lingual dentition of *M. integra*. Lingual membrane composed of forty-eight rows of teeth, arranged in the form common to the group 3, 1, 3. Central tooth broad, short, and hooked, a small shoulder each side near its base; first lateral broad and hooked; second and third lateral long, claw-shaped; anterior part of membrane broad, narrowing toward the middle, and again widening at its posterior portion. First twelve or fourteen rows translucent brown in color, the rest colorless.

Fig. 105.

Lingual dentition of *M. integra*.

The animal of this species is given in Fig. 68, p. 35.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8876	3	.....	W. G. Binney.	Cabinet series.
8877	1	.....	Dr. J. Lewis.	"
8878	4	.....	W. O. Binney.	"
8879	6	Burlington, N. J.	"	"
8880	1	Rine River, N. T.	Dr. J. O. Cooper.	.....
8881	3	Massachusetts.	W. Simpson.	.....
8882	4	Nimshaw River, N. T.	Dr. J. G. Cooper.	.....
8883	4	New York—Erie Canal.	Dr. J. Lewis.	.....
8884	7	Grand Rapids, M.	"	.....
8885	3	N. Illinois.	E. Kennicott.	" ..
8886	4	Erie Canal, N. Y.	Dr. J. Lewis.	" ..
8887	3	"	"	.....
8888	2	"	"	.....
8889	2	"	"	.....
8890	7	Quasqueton, Iowa.	E. C. B.	.....
8891	3	Jerseyville, Ill.	.....	.....
8892	1	Big Sioux.	Dr. F. V. Hayden.	.....
8893	2	Milwaukee, Wis.	I. A. Lapham.	.....
8894	6	Saugamon River, Ill.	D. H. Roberts.	.....
8895	4	Mohawk, N. Y.	Dr. J. Lewis.	.....
8896	7	Illinois.	W. O. Binney.	.....
8897	7	Miss. River.	.....	.....
8898	1	Maryland.	A. N. S.	" ..
8899	2	Maine.	"	.....
8900	2	Orenewich, N. Y.	Dr. Lapalla.	.....
8901	6	Texas or Alabama.	W. G. Binney.	.....
8902	2	Big Prairie Creek, Ala.	Dr. Shoemaker.	.....
8903	3	New York.	Dr. Lewis.	Revolving bands.
8904	5	Batavia, Ill.	W. O. Binney.	.....
8905	3	Grand Rapids, Mich.	Dr. Lewis.	(<i>Pal. rufic.</i> Held.)
8906	7	K. Georgia.	Dr. Jones.	.....
8907	1	Vermont.	Arad. N. Se.	.....
8908	8	Buffalo, N. Y.	Nasone.	.....
8909	7	Alabama.	.....	.....
8910	10	Burlington, N. J.	W. G. Binney.	.....
8911	1	Alabama.	.....	.....
8912	9	Hiram, O.	.....	.....
8913	1	Elyria, N. Y.	.....	.....
8914	10	.....	.....	.....
8915	10	Athens, Ga.	.....	(<i>Pal. rufic.</i>)
8916	2	Astorian, Wis.	S. F. Baird.	.....
8917	3	Schnyder's Lake, N. Y.	Dr. J. Lewis.	.....
8918	4	Racine, Wis.	S. F. Baird.	.....
8919	2	Texas.	W. G. Binney.	.....

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8920	607	Mohawk, N. Y.	Dr. J. Lewis.	(<i>P. rocta</i> .)
8921	4	Grand Rapids, Mich.	"	<i>P. obso.</i> Lewis.
8922	2	Columbus, O.	"	"
8923	1	Ohio.	"	"
8924	2	"	"	" Cab. ser.
9018	1	New York	"	"
9021	1	Delaware River.	W. G. Biancy.	"
9029	1	Coosa River	"	"
9027	30+	Grafton, Mich.	Dr. J. Lewis.	"
9028	7	Kreed's Lake, Mich.	"	"
9029	200+	Grand River, Mich.	"	"
9030	20+	Michigan.	"	"
9031	30+	Brest, Mich.	"	"
9032	20+	"	"	"
9033	100+	Mohawk, N. Y.	"	"
9034	20+	Grafton, Mich.	"	"
9035	600+	"	"	"
9036	20+	Mohawk, N. Y.	"	"
9037	100+	"	"	"
9038	50+	"	"	"
9039	7	Erie Canal, N. Y.	"	"
9040	11	"	"	"
9041	9	"	"	"
9042	12	Mohawk River,	"	"
9043	13	"	"	"
9044	4	Erie Canal.	"	"
9045	10	Mohawk River,	"	"
9046	12+	Erie Canal.	"	"
9047	9	Mohawk River.	"	"
9048	6	Canal, Mohawk.	"	"
9049	6	"	"	"
9050	10	Grand Rapids, Mich.	"	"
9051	7	Grafton, Mich.	"	"
9052	11	Grand Rapids, Mich.	"	"
9053	7	Erie Canal.	"	"
9054	3	"	"	"
9055	100+	Mohawk, N. Y.	"	"
9101	20+	"	"	"
9155	2	Owasco Lake.	Mrs. H. W. Parker.	"
9158	3	Cayuga Lake.	"	"
9157	..	"	"	"
9157	7	Lynn, Mass.	Dr. Prescott.	"
9157	1	Schuykill.	Gen. Totten.	"
9158	3	South Carolina.	"	"
9159	5	Santee Canal.	Ravenel.	"
9380	..	"	"	"
9384	9	Arkansas.	"	"
9311	1	"	L. Agassiz.	"

Melantho coarctata, LEA.—Shell imperforate, ovately turreted, thick, the surface decussated by revolving striae and times of growth; light

Fig. 106.

*Melantho coarctata*.

greenish horn color, with darker longitudinal streaks marking the margins of former peristomes, white under the epidermis; spire elongated, apex entire; whorls 6, regularly increasing, slightly convex, the last one equalling more than one-half the shell's length, imperforate, sometimes compressed and obtusely carinated; aperture

Fig. 107.

*Melantho coarctata*.

scarcely oblique, ovate, longer than wide, more than half the length of the body whirl, within white; peristome simple, acute, sinuose, its margins not on the same plane, its terminations connected by a heavy shining callus upon the parietal wall. Length of the axis 22, greatest breadth of body whirl 15; length of aperture 15, breadth 9 mill.

Paludina coarctata, LEA, Tr. Am. Phil. Soc., IX, 30 (1844); Obs. IV, 30; Proc. II, 243 (1842).—REEVE, Con. Icon. 46 a (Feb. 1863).

Paludina lima, ANTHONY, Proc. Acad. N. S. Phil. 1860, p. 70.—REEVE, Con. Icon. 46 b (Feb. 1863).

Paludina exilis, ANTHONY, Proc. Acad. N. S. Phil. 1860 p. 71.

Paludina compressa, LEWIS in Sched. (Unpublished.)

It has been found in South Carolina, Alabama, Mississippi, and Arkansas.

The striae of growth, very much decussated by revolving deep cut lines, distinguish all the forms mentioned in the synonymy, and constitute one of the chief characteristics of the species. In form it seems capable of some considerable variation, being, at times, very slender and elongate, at others much more ovate, with more globose whirls.

I give below a copy of Lea's description, and a drawing of his original specimen (Fig. 108).

Having before me the original specimens of *Pal. lima* and *exilis*, kindly loaned me by Mr. Anthony, and one determined by Mr. Lea to be his *Pal. coarctata*, I cannot hesitate in uniting them under one specific name, which, of course, will be the earliest published. No. 8867 of the Smithsonian collection is also a specimen of the same, though presented by Dr. J. Lewis under the unpublished name of *Pal. compressa*, Lewis.

Mr. Lea has enabled me to figure his original specimen (Fig. 108). I am able also to add figures of the shells from which Mr. Anthony drew his description of *Pal. lima* (Fig. 110) and *exilis* (Fig. 109). The latter shell is rather more slender than the other forms, one specimen being only thirteen mills. wide, though thirty-one long.

Reeve places *P. exilis* in the synonymy of *P. coarctata*, but considers *P. lima* distinct.

Paludina coarctata, LEA.—Shell smooth, ovate, compressed, thick, imperforate, olive color; spire drawn out; sutures much impressed; whirls flattened; aperture rather small, ovate, white.

Fig. 108.

*Paludina coarctata*.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .50, length .98 inch.

This species, of which a single specimen only was received, differs from all of the genus which has come under my notice. It is remarkable for its compressed form, the body whorl being quite flattened. The apex is eroded, which prevents the number of whorls being ascertained: there appear to be five. The aperture is less round than usual in this genus, and may be rather more than half the length of the shell. (Lea.)

Paludina exilis, ASTHONY (l. c.).—Shell unretted, smooth, rather thick; color light apple-green; spire elevated, composed of about seven volutions; suture well marked; aperture small, broad-ovate, livid within; body whorl distinctly angulated, subumbilicate, and with very distinct lines of growth; columella well rounded and curved with a callous deposit, connecting perfectly with the outer lip, thus forming a continuous rim.

Fig. 109.

*Paludina exilis*.

Length, $1\frac{1}{2}$ inch; breadth, $\frac{3}{4}$ inch.

Hab.—Mississippi. My Cab.; Cab. H. Cumming, London; A. N. S. Philadelphia; State collection, Albany, N. Y.; Smithsonian collection.

Obs.—One of the most slender of our American species; *Paludina subulida*, nob., is more ponderous, more globose, and has a larger aperture; no other species approaches it in general appearance; the whorls of this species taper more rapidly to an acute apex than in most of the species; compared with *P. integra*, Say, it is more slender, more solid, and the aperture is much smaller. (Anthony.)

Paludina lima, ASTHONY (l. c.).—Shell ovate, rather thin, dark green; spire obtusely elevated and composed of six convex whorls, which are strongly striate or subcarinate; sutures very distinct, and the upper part of each whorl being flattened renders it more conspicuous; aperture broad-ovate, about half the length of the shell, livid within; columella slightly rounded and callous deposit small; umbilicus none.

Fig. 110.

*Paludina lima*.

Length, $1\frac{1}{2}$ inch; breadth, $\frac{3}{4}$ inch.

Hab.—South Carolina. My Cab.; Cab. H. Cumming, London; A. N. S., Philadelphia; Smithsonian collection, Washington, D. C.

Obs.—In general form not unlike our western *P. integra*, Say, from which it differs, however, by its revolving, raised striae and by its carinae, which are also well developed; the lines of growth are very strong, and decussating with the striae give the surface a beau-

tifully rough appearance, which suggests its specific name. It is really one of our handsomest species, and so unlike all others that no American species can readily be mistaken for it. In most specimens the body whorl is very strongly carinate about the middle, and the outer lip is considerably produced as in *P. subsolida*, nob. (Anthony.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8865	13	Natchez, Miss.	Lieut. Wallis.	.....
8866	8	"	"	Cabinet series.
8867	2	Jackson, Miss.	Dr. Lewis.	<i>P. conjuncta</i> , Lewis.
8831	9	Big Prairie Creek, Ala.	Dr. Showalter.	.....

LIOPLAX, THOSCHEL.

Foot very large, rather thin, elongated, greatly produced beyond the snout, truncated before, and becoming slightly narrower behind towards its rounded extremity. Colors as in *Melantho*.

Head very small. Snout very short. Lingual teeth smooth at their apices or cusps. Tentacles broader and rather shorter than in *Melantho*. Right tentacle in the male very short, only one-third the length of the left,

Fig. 111.



Fig. 112.



and broader than the snout. Lingual dentition as in *Melantho*. Right cervical lappet narrow, not plicated, but extending beneath the right tentacle and snout, nearly to the base of the left tentacle. Left cervical lappet very small. Branchiae as in *Melantho*. (Stimpson.) Operculum with a sub-spiral nucleus.

Shell thin, ovate-turreted, imperforate, spire produced, whorls rounded, carinated, covered with a thin epidermis; peristome thin, continuous.

Fig. 113.



Operculum of *Lioplax subcarinata*.

Lioptax cyclostomatiformis, LEA.—Shell subcylindrical, rather thick, pale horn color, smooth, imperforate; spire exerted, at the apex rose colored and obtuse; sutures very much impressed; whorls five, rounded; aperture small, nearly round, within salmon colored.

Coosa River, Alabama. Dr. Brumby. My cabinet, and cabinets of Dr. Griffith, Dr. Jay, L. W. Sloat, and Dr. Foreman. Diam. .32, length .82 of an inch.

Fig. 114.



Lioptax cyclostomatiformis.

This is a very remarkable species, assuming very much the form of an exerted *Cyclostoma*. A single, somewhat worn specimen only, was received. The aperture is rather more than one-third the length of the shell. Its subcylindrical form is very remarkable.

Since the above description was written, Dr. Jay and Dr. Foreman have placed in my hands specimens from the same locality. The epidermis is perfect, and they are of a greenish horn color. The interior of the aperture is bluish, while the apex is slightly salmon colored. (Lea.)

Paludina cyclostomatiformis, LEA, Tr. Am. Phil. Soc. IX, pt. 1, p. 23 (1844); Obs. IV, 23; Proc. II, 83, (1841).—REERVE, Con. Icon. 43 (Feb. 1863).

Paludina contorta, SHUTTLEWORTH, of KÜSTER in Chemn. ed. 2, p. 20, pl. IV, f. 7-9 (1852).

Paludina elliotti, LEA, Proc. Acad. Nat. Sc. Phila. 1858, p. 166.

The specific name of this species must not be confounded with that of *Pal. cyclostomatiformis* of D'Orbigny (Mag. de Zool. 1837, cl. v, pl. ixxix, f. 1)

The outline of the back of the shell reminds one of the Cuban *Megalomastoma*. The three upper whorls are sometimes of a very light flesh color, contrasting with the dark green of the remainder. The peristome is sometimes continuous, being appressed to the body whorl, and forming a rimate umbilicus. On some specimens I have detected minute revolving lines.

Pal. elliotti is a finer, better developed form of the species than that described as *cyclostomatiformis*, and has more acutely carinated upper whorls. A careful examination of Mr. Lea's types leads me to consider them identical. With his original description of the latter I have given Fig. 114 from his type, while below will be found the description of *Pal. elliotti* and a figure (115) of a specimen presented me under this name by Mr. Lea and now in the Smithsonian collection (No. 9015).

I have placed *Paludina contorta* in the synonymy of this species after a careful examination of a specimen received by Mr. Bland

from Mr. Shuttleworth. The original description given below, and the copy of the figures (Fig. 116) confirm my opinion of its identity with Mr. Lea's shell.

Since the publication of this paper in the form of proof, Mr. Gill has criticized my opinion of the identity of *Pal. elliotti* with *P. cyclostomatiformis*. His opinion was not based on an examination of specimens, and has since been changed on seeing the Smithsonian series.

Paludina elliotti, LEA (l. c.).—Shell subcarinate, pyramidal, rather thick, greenish-olive, smooth, very narrowly umbilicated; spire elevated, subacute, flesh-colored at the apex; sutures excavated; whorls 7, rounded, obtusely carinated above, rather small; aperture subrotund, small, white within.

Othcalooga Creek, Ga. Bishop Elliott. (Lea.)

Fig. 115.

*Paludina elliotti*.

Paludina contorta, SHUTTLEWORTH (l. c.).—Shell non-rimate, cylindrically conic, subovate, shining, greenish with olive lines; apex eroded; whorls 6, strongly convex, divided by a deep suture, the middle ones carinated in the middle; aperture oblong, white; peristome straight, acute, curved above.

Fig. 116.

Shell smooth, cylindrical-conic, tapered with a truncated apex; shining, green, with olive brown lines and striae; sutures deep; whorls 6, ventricose, moderately increasing above, rapidly so towards the base, the middle ones clearly carinate in their centre, with brown angular curving striae and lines at the middle keel; last whorl shorter than the penultimate, and near the upper portion of the aperture separated so as to form a deep groove of the suture. Aperture longitudinally rounded, inner lip appressed; peristome straight, acute, twisted above (fig. 9), curving again below its centre, beautifully rounded below and regularly blending with the columella. Height 5", breadth 5".

*Paludina contorta*.

Alabama (Ruge), coll. Charpentier. (Kuster.)

Reeve, l. c., adopts the same view of *Pal. elliotti* and *contorta* as I have done.

No. 9147 of the collection is almost ecarinate, and nearer Mr. Lea's type of *cyclostomatiformis* than *elliotti*.

It is singular that the only two known species of *Lioplax* should share the peculiarity of having a strongly carinated form with perfect apex, as well as a form with rounded whorls and truncated apex.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8808	1	Coosa River, Ala.	W. G. Binney.	.....
8809	1	Alabama.	A. N. S. Phila.	Cabinet series.
9015	1	Georgia.	I. Lea.	Figured in Fig. 115.
9149	1	Coosa River, Ala.	Dr. E. R. Showalter	.....

Fig. 117.

*Paludina subcarinata.*

***Lioplax subcarinata*, SAY.**—Shell with three whorls, which are rounded, and subcarinated, reticulated with striae and wrinkles, sometimes without the striae; suture deeply impressed; apex truncated and re-entering; aperture more than half of the length of the shell, oval; elevated lines or subcarinae on the body two, three, and sometimes none. Length half of an inch, breadth four-tenths.

Inhabits with the preceding species. (Delaware River.)

Animal viviparous, with a chestnut, coriaceous operculum, white, spotted with orange; head pale orange, not extending beyond the shell; tentacula darker, short, subulate; eyes situated at their base, elevated, black and conspicuous; base of the animal much advanced, broad, truncate, purplish before, tail rounded behind. (*Say*.)

Limnea subcarinata, SAY, olim. Nich. Enc. ed. 1, 1817; ed. 2, 1818, pl. II, f. 6.

Paludina subcarinata, SAY, Nich. Enc. ed. 3, 1819, pl. I, f. 7; ed. BINNEY, p. 47, pl. LXIX, f. 7.—HALDAMAN, Mon., p. 8, pl. II (1840).—DA KAY, N. Y. Moll., p. 87 (1843).—CHERRY, Conch. Ill., pl. I, f. 6-8.—PHILIPPI, Conch. II, 7, pl. II, f. 7 (1846).—KÜSTER, in CHOMM. ed. 2, p. 29, pl. vi, fig. 10-14.—REEVE, Con. Icon. 44 (Feb. 1863).—Not of POTIER ET MICHAUD.

Paludina sulcosa, MEXKE, Syn. Meth. p. 134 (1830).

Paludina bicarinata, POTIER ET MICHAUD, Gat. des Moll., I. 249, pl. XXV, f. 17, 18.

Helix decina, WOOD, Cat. Suppl. p. 21, pl. VII, f. 17 (1828); HANLEY'S ed. 226, f. 17 (1856).

Helix subcarinata, EATON, Zool. Text-Book, 195 (1826).

Lioplax subcarinata, THOSCHEL, Gebiss der Schn. 100 (1857).

There are in the mature perfect shell 3 more whorls than the number given by Mr. Say. It is a very variable shell. The whorls are sometimes truncated at the apex, very much rounded and hardly marked by the carinae (Fig. 118), which in other localities are much developed, continuing to the sharp, well-defined apical whorls, on which is no trace of erosion (Fig.

*Lioplax subcarinata.*

Fig. 119.

*Lioplax subcarinata.*

119). Sometimes there is a prominent revolving

Fig. 120.

*Lioplax subcarinata.*

elevated ridge below the carina on the body whorl. The revolving striae are sometimes very strongly marked.

The operculum, which in the young shell is subspiral, in its later growth is concentric as in the other species of *Viviparidæ*.

I have received specimens from Ohio, Indiana, Kentucky, Pennsylvania, and New Jersey.

Paludina sulculosa, Menke, l. c., appears to me to be this species. I have seen no authentic specimen. His description is as follows:—

Paludina sulculosa.—Shell ovate-conoid, apex deroded; imperforate, thin, decussately striated, transversely lightly sinuated; green; whorls 4, angulated on the spire; suture deep; aperture ovate; lip simple. Length $4\frac{1}{2}$, breadth 3 lines.

Ohio River at Cincinnati. Bosche. (*Menke*.)

Paludina bicarinata, Potiez and Michaud, is certainly this species, as shown by their description and the copy of the outline of their figure given below.

Paludina bicarinata, Pot. et Mich. (l. c.) not Say.—Shell oval, ventricose, brown or greenish, covered with numerous transverse ridges, two of which are more developed on the last whorl, the other whorls having but one medial carina; spire comprised of three or four convex whorls, of which the first are usually truncate; aperture ovoid; peristome simple. Length 12-15, breadth of last whorl 10-12 mill.

Mr. Say and Ch. des Monlins have both given the same name to two different shells belonging to this genus, consequently it becomes necessary, in order to avoid confusion, to change that of Des Monlins, being posterior to Mr. Say's. Moreover, M. des Monlins' shell having three carinae, will be better designated by the name *tricarinata*, adopted in this catalogue.

Delaware River, N. America. (*Potiez et Michaud*.)

I give also an outline of Wood's figure (Fig. 123) of *decisa*, of which no description is given, though it is specified as "tawny Delaware." It is evidently *Lioplax subcarinata*.

In addition to the above fac-similes I have given one of Say's figures in Nicholson's Encyclopedia (Fig. 117.)

Fig. 121.

Operculum of *Lioplax subcarinata*.

Fig. 122.

*Paludina bicarinata.*

Fig. 123.

*Paludina decisa*, Wood.

Fig. 124.

Lingual dentition of *Lioplas subcarinata*.

The lingual dentition of *Lioplas subcarinata* is thus figured by Troschel (Fig. 124). There are seven teeth in each row, with recurved, simple, acute apices, the central broad at the

base, narrower above, the laterals narrower. For the animal see p. 55.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8870	50+	Raritan River.	W. G. Binney.	.....
8871	5	.....	W. Simpson.	Cabinet series.
8872	20	Burlington, N. J.	W. G. Binney.	.....
8873	9	Ohio.	W. Simpson.	.....
8874	5	Licking River, Ky.	W. G. Binney.	.....
8875	8	Laport, Ind.	"	.....
9013	1	.....	.....	Figured in Fig. 118.
9016	20+	Laport, Ind.	Dr. Lewis.	.....
9017	20+	Bank Lick, Ky.	"	.....

DOUBTFUL, SPURIOUS, AND EXTRA-LIMITAL SPECIES OF VIVIPARIDÆ.

This completes the list of known North American *Viviparidæ*. There now follow notices of doubtful species and those which have been erroneously referred to the genus.

In the Trans. Lit. and Hist. Soc. Quebec, I, 196, occur the two following descriptions by Mrs. Shepard:—

Paludina ———.—Shell white; epidermis olive; ^{the} _{the} length of the aperture; last whirl inflated. Island of Orleans.

Paludina ———.—Shell pale buff; spire longer than the aperture; top obtuse. Found with the foregoing on the beach at the island; the whirls are not so much inflated as those of this genus generally are, but I think it would not range under any other; it has bluish bands of gray round the top of the whirls.

Paludina alleghaniensis, GREEN.—Shell conical; spire elevated and rather obtuse; whirls four, rounded and nearly smooth, the ultimate whirl the largest; mouth oval, slightly angular near the upper part of the peristome, where it adheres to the body whirl; navellicus none; epidermis dark brown color. Length two-tenths of an inch. Fine specimens of the shell are in the cabinet of Mr. W. Hyde. Mountains of Pennsylvania. (Green.)

Paludina alleghaniensis, GREEN, in Doughty's Cabinet of Nat. Hist., II, p. 291 (1832).

The above is Green's description. I have not been able to obtain any information about the species. From the size and shape of the shell I should incline to believe it to be an *Amnicola*.

Paludina solida, SAY, is mentioned by name only by Cristofori & Jan, Conch. Terr. et Flav. p. 7 (1832).

Paludina canaliculata, GOULD, is mentioned by name only in the Preliminary Report on Mass. Shells, p. 107, and by WHEATLEY, Cat. 29.

Paludina unicolor, LAM., from South Carolina, mentioned by name only by WHEATLEY in his Cat. of U. S. Shells, p. 30. I have never known of any such species having been found there.

Vivipara bengalensis, LAM. (*Pal. elongata*, SWAINSON.—*Pal. multilinea*, SAY, N. H. D. II, 245, 1829, BENNETT's ed., p. 146.—*Pal. vitula*, RAPINISQUE, (Bengal.) Atl. Journ., V. 109), said to have been found in St. John's River, Fla. Mr. Say's words are as follows: "Capt. Leconte presented me with a shell which, he informed me, he found in the River St. John, Florida. I described it nearly four years since under the name of *multilinea*; but, recently, being about to publish it, on a more attentive examination and comparison with a specimen of the *elongata* from Calcutta, given to me by Mr. Hyde of Philadelphia, I have concluded that it varies from that specimen only in having the umbilicus a little smaller."

See also *Ampullaria rotundata*, p. 6.

I have seen some specimens said to have come from Florida which might be referred to this species, but at present cannot consider its existence there sufficiently established to admit it in the list of American *Vivipara*. HALDEMAN (Mon., p. 24, pl. vii, f. 3, 4), thus describes and figures it, considering it probable that it was accidentally introduced into Florida together with *Ampullaria rotundata*, SAY. They are both Calcutta shells:—

Fig. 125.



Paludina bengalensis.

"Shell lengthened, conic, and polished; composed of six or seven convex whorls, the surface of which is covered with minute transverse wrinkles, and numerous narrow spiral bands; apex pointed; suture deep; lines of secretion very fine; aperture regularly rounded, produced posteriorly. Color bright green, often passing into brownish; the spiral bands are fuscous, and the inside white." See also HALDEMAN, Mon. 24, pl. vii, f. 3, 4 (1841).

Paludina minuta, SAY, of KÜSTER, Chemn. ed. II, p. 52, pl. x, f. 15-16, is *Cingula minuta*, TORREX. Mr. Say never described any such species. I have not given Küster's description as he quotes Totten's description, leaving no doubt of its identity.

Paludina hyalina, LEA, Tr. Am. Phil. Soc. VI, 17, pl. xxiii, f. 81 (1839), (not of MORELET), is a distorted *Planorbis exaratus*, q. v. (Land and Fr.-West. Sh. II.)

Paludina turrita, MEXKE, Syn. Meth. p. 40, is mentioned by name only, *Cyclostoma marginatum*, SAY, being mentioned doubtfully as a synonym.

Paludina aculeus, KÜSTER, Chemn. ed. II, p. 73, pl. xiii, f. 8-9, is there said to be *Cingula aculeus*.

Paludina scalaris, JAY, Cat. 3d ed. 112, pl. 1, f. 8, 9 (1839) = *Physa scalaris*, q. v. (Land and Fresh-Water Shells, II.) The name is also used in Zeit. für Mal. II, 164, 1845, by DUNGER.

Paludina porata, SAY, is mentioned by name only in MENCKE'S Syn. Meth. p. 42 (1830) with *P. katschkana*, PARR. and *P. fluminensis*, ZIEGLER, as its synonymus.

Paludina costanea, VALENCIENNES, Humboldt and Bonpland, Rec. d'Obs. II, 256, is not specified as American. The description was drawn from a specimen in the Paris Museum, locality unknown.

Paludina viridis of Virginia is quoted without description by SOWERBY (Tank. Coll. p. 43), *Helix viridata*, BUDOLPH MS. being given as a synonym.

Paludina maxima, RAVENEL, Cat. 12 (1834), is unknown to me. No description was ever published.

Paludina decipiens is mentioned by name only among the American species added to those cited in Lamarck's Animaux sans Vertèbres, by GOULD'S translation (p. 70, Genera of Shells). I have no information concerning it.

Finding *Pleurocera* of Rafinesque quoted in the synonymy of *Vivipara* by Adams, Gen. Rec. Moll., I was inclined to place the following species in *Vivipara*, but now omit them. See Rafinesque's Complete Writings, 1864, pp. 65 and 67.

Pleurocera acuta, Enum. and Acc., p. 3.

Pleurocera rugosa, " " " p. 3.

Pleurocera gonula, " " " p. 2.

Pleurocera verrucosa, Ann. of Nat., No. I, p. 11 (1820).

The genus *Pleurocera* is considered by Haldeman (Mon. of *Leptoxis* and Encycl. Icon., Baird's ed.) to be the same as *Io*, Lea, which last name not having priority of publication would be considered a synonym of *Pleurocera*. The following description of Rafinesque is translated from the Journal de Physique, &c. of Brussels, LXXXVI, p. 423. The fac-simile Fig. 126 is from a MS. work of the same author, "Conchologia Ohioensis," presented by Prof. Haldeman to the Smithsonian Institution.

Pleurocera, l. c.—Shell spiral, oval or pyramidal, numerous rounded whorls; aperture oblong, oblique, base prolonged, twisted, narrowed above; outer lip thin, interior lip appressed to the columella, which is smooth and twisted, without umbilicus. Animal with a membranaceous operculum, proboscis-like head, inserted on the back; tentacles two, lateral, subulster, sharp, eyes at their exterior base. Family of *Turbinacea*. Species numerous, of which I have already twelve, all fluviatile, from rivers and creeks. (*Rafinesque*.)

Fig. 126.



Pleurocera.

Onphemis plaioxis and *lacustris* of Rafinesque are mentioned by name only (Journ. de Phys. LXXXVIII, p. 424. The generic description is as follows:—

Shell oval; aperture rounded, lips detached, columella separated from the lower lip by a small oblong umbilicus; spire slightly oblique; animal with a membranaceous operculum, two flattened lateral tentacles, eyes at their exterior base. Family *Turbinacea*. Two species, *O. lacustris* and *plaioxis*, which is fluviatilis. (Rafinesque.)

I take this opportunity of giving a fac-simile of a figure of the animal of *Leptoxis* as well as Rafinesque's description, translated from the work referred to, p. 424. The figure (127) is copied from the same MS. as that quoted on the last page, written in the well-known hand of Rafinesque.

Fig. 127.

Animal of *Leptoxis*.

Leptoxis, l. c., differs from *Lymnaea* by its oval, ventricose shell of two or three whorls; aperture oval, almost as large as the whole shell; eyes exterior. Four species, fluviatile, &c. (Rafinesque.)

To the genus *Somatogyrus* (q. v.) must be referred the following:—

Paludina altitia, RAVENEL, undescrib. Cat. S. C. 12 (1834).

Paludina pallida, LEA.

Paludina subglobosa, SAY.

Paludina fontinalis, PHIL.

Paludina isogona, DEKAY.

To the genus *Amnicola* (q. v.) must be referred the following:—

Paludina sayana, KÜSTER, CHEMN. ed. 2, p. 48, pl. ix, f. 30-32.

Paludina emarginata, KÜSTER, l. c. p. 50, pl. x, f. 3, 4.

Paludina cincinnatiensis, KÜSTER.

Paludina porata, KÜSTER, l. c. and of PHILIPPI.

Paludina lustrica, KÜSTER, l. c.

Paludina granosa, SAY, of KIRTLAND'S Ohio Report, p. 174 (1838), and Sill. Am. Journ. [1] XXXI, 36 (1836); probably *Amnicola granum*, Say.

Paludina grana, SAY.

Paludina limosa, SAY.

Paludina obtusa, LEA (not of TROSCHEL).

To the genus *Pomatiopsis* (q. v.) must be referred the following:—

Paludina lapidaria, KÜSTER, l. c.

Paludina nickliniana, LEA.

To the genus *Fluminicola* (q. v.) must be referred:—

Paludina nuttalliana, LEA.

Paludina nuclea, LEA.

Paludina virens, LEA.

Paludina seminalis, HINDS.

To the genus *Leptoxis* are to be referred the following species:—

Paludina dissimilis, SAY (BISSEY'S ed. p. 48); DEKAY, N. Y. Moll. 86 (1843), and POTIER & MICHAUD, Gal. des Moll. I have not considered it necessary to repeat Mr. Say's description, the species being well known and universally acknowledged to be a *Leptoxis*.

Paludina crenata, SAY, is mentioned as a species of *Leptoxis* by Dr. Brot in his admirable "Matériaux pour servir à l'étude de la famille des Mélaniens," p. 24. Mr. Say described no such species. Prof. Haldeman describes a *Leptoxis* under this name in the Monograph referred to by Dr. Brot. See also *Somatogyrus*.

Fig. 128.



*Paludina
humerosa.*

Paludina humerosa, ANTHONY, l. c.—Shell ovate, thick, bright green, imperforate; spire rather obtusely elevated, composed of about 5—6 convex whorls; upper whorls smooth, body whorl and preceding one strongly striate and granulate or subgranulate; sutures very distinct; aperture ovate, nearly one-half the length of the shell, livid within.

Length about half an inch.

Alabama. My cabinet.

A single specimen only is before me, but it is sufficiently distinct; its granulated surface and the broad shouldering of the whorls are its chief characteristics; compared with *P. genicula*, Com., it is more slender, darker in color, and its granulated surface is of itself a sufficient distinction. (Anthony.)

Paludina humerosa, ANTHONY, Proc. Acad. Nat. Sc. Phila. 1860, p. 71.

From an examination of Mr. Anthony's type I have no doubt of this being a nodulous species of *Leptoxis*, on which the nodules are slightly developed. Fig. 128 is drawn from it.

To the genus *Melania* are to be referred—

Paludina virginica, SAY, Nich. Eno. 3d ed. (1819).

Paludina rudis, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was given by Dr. Ravenel, who informs me that he found the species at Danville, on the Dan River, and subsequently sent some specimens to Mr. Lea, who described them as *Melania inflata*.

Paludina nitida, RAVENEL (Cat. of Cabinet, p. 12, 1834). No description was published. Dr. Ravenel informs me that on submitting specimens to Mr. Lea he pronounced them an undescribed species of *Melania*. They were found in the Dan River, at Danville.

To the genus *Rithyia* (q. v.) has been referred the following:—

Paludina tentaculata, LAM.

To the genus *Lithasia* is to be referred—

Paludina incrassata, LEA. — Shell smooth, elliptical, rather thin, imperforate, dark horn color; sutures somewhat impressed; whorls somewhat convex; columella thickened above; aperture rather round, small, within bluish.

Alabama. E. Foreman, M. D. Cabinet of Dr. Foreman. Diam. .52, length . . . inch.

Rather more than the first whorl only of the specimen before me is perfect, and I would not have proposed it for a new species, but that this part differs from any which has come under my notice. The collins on the superior part of the columella is very like that we find in the genus *Anculosa*. The aperture is smaller than usual in this genus. The upper whorls being decollate, neither their number nor the form of the spire can be given. (Lea.)

Fig. 129.



Paludina incrassata.

Paludina incrassata, LEA, Tr. Am. Phil. Soc. IX, 30 (1844); Obs. IV, 30; Proc. II, 243 (1842).

The figure given above (Fig. 129) is taken from Mr. Lea's original specimen. I have not seen others.

Paludina thermalis, LINN., is quoted by PHILIPPI from the United States, *Turbo minutus*, SAY, being given as synonym (Arch. f. Nat. 1844, 28).

FOSSIL SPECIES OF VIVIPARIDÆ.

Dr. Meek furnishes the following list of fossil American *Viviparæ*, most of which were first described as *Paludina* :—

<i>Vivipara vetusta</i> ,	MEEK & HAYDEN	Phila. Proc.	1860, 43; 1856, 121.
<i>Vivipara leail</i> ,	"	"	1860, 184; 1856, 121.
<i>Vivipara retusa</i> ,	"	"	1860, 185; 1856, 122.
<i>Vivipara conradi</i> ,	"	"	1860, 185; 1856, 122.
<i>Paludina peculiaris</i> ,	"	"	1856, 122.
<i>Vivipara trochiformis</i> ,	"	"	1860, 185; 1856, 122.
<i>Vivipara leidy</i> ,	"	"	1856, 123.
<i>Vivipara raynoldsiana</i> ,	"	"	1861, 446.
<i>Vivipara nebrascensis</i> (<i>Paludina multilineata</i>),	MEEK & HAYDEN,	Phila. Proc.	1856, 120; 1860, 430.
<i>Vivipara glabra</i> ,	H. C. LEA, teste CONRAD,	Proc. Phila. A. N. S.	1862, 567.

FAMILY RISSOIDÆ.

Lingual teeth 3, 1, 3; the rows being more transverse and less arcuated than in the *Littorinidæ*. Rhachidian tooth broader than long, and armed with basal denticles (so called

by Troschel) on each side, which may be either on the basal margin, or on the anterior surface of the tooth above the base; cusp recurved and denticulated. Intermediate tooth

Fig. 139.

Lingual dentition of *Amnicola sayana*.

more or less hatchet-shaped, having a handle-like process (peduncle) projecting outwardly from the base of the broad body which is denticulated at the upper margin. Lateral teeth generally slender and armed with numerous minute denticles at their superior margins. Shell small, spiral, turreted or depressed, often more or less umbilicated; aperture more or less rounded, never truly channelled in front; peristome continuous. Tentacles elongated, with the eyes at their outer bases. Verge (male organ) exerted, situated on the back at a considerable distance behind the right tentacle. Gills both pallial; the right or principal one usually rather short and broad, and composed of few laminae, which are much broader than high. Foot oblong, truncate before, rounded or pointed behind. Operculigerous lobe well developed. Operculum horny or partly shelly, spiral or concentric.

Station in fresh, brackish, or sea water, rarely on land. Distribution mundane.—[Stimpson.]

Dr. Stimpson subdivides the *Rissoidea* into the following sub-families:—

BYTHINIINÆ, with an ovate shell, a concentric operculum which is calcareous within, and with cervical lobes. They are comparatively large. Fresh water. Genus *Bythinia*, Gray.

RISSOININÆ, with an ovate or turreted shell, and a thick, corneous, subspiral operculum provided with an internal process (articulated). Size small. Marine. Genus *Rissoina*, D'Orb. (See Stimpson's paper, p. 39.)

RISSOINÆ, with an ovate or elongated shell, and a subspiral operculum not provided with a process. Foot without lateral

sinuses. Rhachidian tooth of the lingual ribbon with the basal teeth on the inferior margin. Size small. Marine. Genera *Rissoa*, Frem., *Cingula*, Flem., *Alvania*, Risso, *Onoba*, H. & A. Ad., *Setia*, H. & A. Ad., *Ceratia*, H. & A. Ad.

SKENEINÆ, with a depressed, almost discoidal shell, and a corneous, paucispiral operculum. Minute. Marine. Genus *Skenea*, Flem.

HYDROBIINÆ, with shell and operculum and foot like those of the *Rissoinæ*, but with the rhachidian tooth of the lingual ribbon having the basal teeth on the anterior surface, behind the lateral margins. Size variable; some are minute, some as large as *Bythinæ*. Living in fresh or brackish water. Genera *Hydrobia*, Hartm., *Littorinella*, Brann, *Amnicola*, Gould & Hald., *Bythinella*, Moq.-Tand., *Stenothyra*, Benson, *Tricula*, Benson, *Pyr-gula*, Christ. & Jan, *Paludestrina*, D'Orb., *Tryonia*, Stm., *Potamopyrgus*, Stm., *Lithoglyphus*, Muhlfeldt, *Fluminicola*, Stm., *Gillia*, Stm., *Somatogyrus*, Gill, *Cochliopa*, Stm.

POMATIOPSINÆ, with the shell and operculum as in the *Rissoinæ*. Foot with lateral sinuses. Size small. Amphibious. Genus *Pomatiopsis*, Tryon.

The land and fresh-water species only are included by me in the following pages. The figures are all somewhat enlarged.

BYTHINELLA, Moq.-TAND.

Lingual dentition of *B. thermalis*, according to Troschel: Rhachidian tooth moderately long, with the infero-lateral angles much produced. Intermediate tooth with the body longer than

Fig. 131.



Lingual dentition of *Bythinella nichifinana*.—(STIMPSON.)

broad. Formula of the denticles: $\frac{9}{1+1} - 6 - 18 - 0$. Tentacles tapering, but blunt at tip. Foot rather narrow, rounded behind.

Verge (in *B. ferrusina*) bifid. Shell elongated-ovate, usually somewhat pupiform, imperforate, or simply rimate; apex obtuse. Aperture oval or rounded; peritreme continuous, slightly thickened. Operculum corneous, with the nucleus moderately large, not very close to the basal margin.

Station, fresh water.

Distribution, Europe and North America. (*Stimpson.*)

***Bythinella attenuata*, HALD.**—Shell unusually long, slender, with 6 or 7 obliquely revolving, very convex whorls, separated by a deep suture; aperture small, ovate, with the peritreme level and continuous; labium in contact with the body whorl, leaving scarcely any perforation.

Fig. 132.



Bythinella attenuata.

Color pale-green beneath an extraneous coating of black. Taken from a spring in Montgomery County, Virginia, connected with Roanoke River.

I am not confident that this is not the adult of *nickliniana*, as there is a very close resemblance between that shell and the young of this species, when it has but four volutions. In the latter, the aperture appears to be rather contracted. (*Haldeman.*)

Amnicola attenuata, HALDEMAN, Mon. pl. 4, p. 3 of wrapper (1842); *Is.* Mon. p. 22, pl. 1, f. 13 (1844?); *Is. Journ. Acad. N. So. Phila.* VIII, 200 (1842); *Is. Proc.* I, 78 (1841).

Amnicola elongata, HALDEMAN, *l. c.* in plate.

It is also said to inhabit New York. *Amnicola elongata*, Jay, of the Smithsonian Check Lists, is probably this species. No synonymy or reference is given by Dr. Jay (*Cat.*, p. 278).

***Bythinella nickliniana*, LEA.**—Shell turreted, green, smooth; apex obtuse; whorls 4, convex; aperture ovate. Hot Springs, Va. Diam. two-twentieths; length three-twentieths inch.

Fig. 133.



Paludina nickliniana.

This shell, with several other species, was brought by Mr. Nicklin from the Hot Springs of Virginia, and kindly placed in my cabinet. It lives in a rivulet, whose channel is supplied by the waters of a hot and a cold spring. The *Physa*

Fig. 134.



Bythinella nickliniana.

bursa inhabits the same stream. It is the smallest species I knew in our country, except the *granosa* of Say. It is rather larger, and very much resembles the *viridis* Lam. Its habitat, however, is very different, as the *viridis* lives in cold fountains. (*Lea.*)

Paludina nickliniana, LEA, Tr. Am. Phil. Soc. VI, 92, pl. xxiii, f. 109 (1839); Obs. II, 92.

Ammicola nickliniana, HALDEMAN, Mon., p. 21, pl. 1, f. 12 (1844?).

Mr. Lea's figure (Fig. 133) not being as correct a representation as desirable of the species, I add another (Fig. 134), copied from Haldeman.

The lingual dentition is figured on page 131.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8972	100+	Fishing Creek, Clinton	.....	Teste Lea.
8931	3	" [Co., Pa.]	.....	Cabinet series.

Bythinella tenuipes, COUPER.—Animal "with the head probosciform, sub-bifid, sub-cylindrical; foot strap-shaped, anterior portion extending laterally, and emarginate before; tentacles setaceous; eyes at the external base of the tentacles; color, except the head and eyes, mottled white.

Shell "small, one and a half lines long, subumbilicated, oblong-ovate, turreted, thin, smooth, lines of growth very slightly marked; color light brown; volutions five, suture slightly impressed; aperture ovate, oblong, angulated above, rounded at base; labrum simple, sharp.

"Found in the rice-field ditches at Hopeton, Georgia; movement active, made by the joint action of the head and foot, the head advancing before the foot; floats on the surface of the water in an inverted position." (Couper in Haldeman.)

Ammicola tenuipes, COUPER, in HALDEMAN'S Mon. 23, pl. 1, f. 14-15 (1844?); No. 7, p. 4 of wrapper (1844).

Bythinella binneyi, TRYON.—Shell minute, elongated, consisting of 4 to 5 very convex whorls; apex somewhat obtuse; aperture ovate or nearly suborbicular, both lips rounded; umbilicus very small. Color light horn. Length 3, diam. 1.6; length of aperture 1.25, breadth 1 mill.

Bolinas, California. Rev. J. Powell. My cabinet and cabinet of Mr. Powell. Some specimens of this very small and exceedingly fragile species were sent to me; they exhibit, however, all the stages of growth from the very young to adult form. None of them retained the operculum. It is much smaller than any other species of *Pomatopsis*, and is not likely to be confounded with any of them. It approaches nearest in form to two European species of *Bythinia*, *B. acuta* and *B. viridis*; the former, however, has a more lengthened, acute spire, and the latter is a more robust and ventricose shell. (Tryon.)

Fig. 135.



Bythinella tenuipes.

Fig. 136.



Pomatopsis opaca binneyi.

Fig. 137.



Bythinella binneyi.

Pomatiopsis binneyi, TRYON, Proc. Phila. Acad. 1863, 148, pl. 1, f. 10.

Mr. Tryon's description is given above, as well as a fac-simile of his figure (Fig. 136). I have also given another figure of his original specimen.

***Bythinella obtusa*, LEA.**—Shell subcylindrical, rather thin, dark-green, smooth, slightly perforate; spire short; at the beaks very obtuse; sutures impressed; whorls four, convex; aperture small, nearly round.



Bythinella obtusa.

Ohio. Diam. .07, length .10 inch.

This is among the smallest of the genus, and may at once be distinguished by its obtuse apex, which has the appearance almost of being truncate. The whorls do not decrease regularly from the lower one to the apex, the greatest diameter being apparently across the second whorl. In form, therefore, it has the aspect of a *Pupa*. It answers partly to the description of *Paludina alleghaniensis*, Green, but seems to differ in the truncate appearance of the apex, and in its size. Two specimens were found in a box, with some other small species, kindly sent me by Dr. Kirtland. It is rather less than *Pal. nickliniana*, but differs from it in being less tapering to the apex. It closely resembles *P. viridis*, Lam., but is rather larger, and more obtuse. There were no opercula to examine in these specimens; aperture rather more than one-third the length of the shell. (Lea.)

Paludina obtusa, LEA, Tr. Am. Phil. Soc. IX, 13 (1844); Obs. IV, 13; Proc. II, 34 (1841).

Amnicola obtusa, HALDEMAN, Mon. p. 24 (1844?).

Figure 138 is drawn from Mr. Lea's original specimen.

TRYONIA, STIMPSON.

Shell perforate, elongated, turreted, subulate, acute at summit and rather pointed at base; surface longitudinally ribbed or plicated, not spinous; whorls numerous, shouldered. Aperture small, oblique, rhombo-ovate; and somewhat pointed, sinuated, and effuse at base; outer lip thin and sharp, projecting below; inner lip appressed to the whorl above, peritreme however continuous. Operculum and lingual dentition unknown.

Station, fresh water.

Distribution, Southern California. (Stimpson.)

Tryonia clathrata, STIMPSON.—Whirls eight. Longitudinal ribs variable in number, usually about twelve to each whirl. Surface otherwise smooth, or marked with delicate incremental striae. There is no trace of revolving striae or lines. Length 0.2 inch.

The specimens described are in a semi-fossilized condition, mostly white, though not chalky, but with an ivory-like hardness. Some of them are translucent, looking as if silicified. From the circumstances under which they were found, however, it is probable that the species existed within a very recent period, if not indeed now-living.

Large numbers of specimens were found, in company with other dead fresh-water shells of the genera *Physa*, *Planorbis*, *Amnicola*, *Cyclos*, etc., in the basin of the Colorado Desert, Southern California, by Mr. Wm. P. Blake, on one of the Pacific Railroad Surveys. The basin is the bed of an ancient lake, now dry. The specimens collected by him are in the museum of the Smithsonian Institution. (Stimpson.)

Tryonia clathrata, STIMPSON, Am. Journ. Conch. I, 54, pl. viii, f. 1, 1865.

The figure I have given is not a fac-simile of that of Stimpson.

Tryonia protea, GOULD.—Shell elongate, slender, variable; whirls seven to eight, rounded, divided by a deep suture, simple or variously ornamented, and barred with revolving ridges and longitudinal folds; aperture ovate; lip continuous, simple, scarcely touching the penultimate whirl. Length of the largest specimen three-tenths, breadth, one-tenth inch.

From the Colorado Desert (Gran Jernada), Dr. T. H. Webb, W. P. Blake.

Peculiar from its large size and slender form, though differing greatly in its relative proportions. It differs from all others, in being variously sculptured with revolving ridges and longitudinal folds, like most *Melania*. It varies greatly also in the relative proportions of length and breadth. It is as slender as *Amnicola attenuata*, Hald., and much larger. This appears to be the same shell as that subsequently described by Mr. Conrad, under the name of *Melania exigua*. (Gould.)

Amnicola protea, GOULD, Proc. Bost. S. N. H. V, 129 (March, 1855); P. R. R. Rep. V. 332, pl. xi. fig. 6—9 (1857); Prelim. Rep. App. 24 (1855); Otis, 217.

Melania exigua, CONRAD, Proc. A. N. S. Phila. VII, 269 (Feb. 1855).

Two of Dr. Gould's figures are copied in my figure (140). With them may be compared Fig. 141, which is drawn from a specimen presented by Prof. Haldeman (No. 9143), and pronounced by Mr. Conrad to be his *Melania exigua*, it having been one of

Fig. 139.



Tryonia clathrata.

Fig. 140.



Amnicola protea.

the original specimens collected by Dr. Le Conte. Mr. Conrad's description, given below, bears an earlier date than that of Dr. Gould, but was not actually published at that time. I have, therefore, retained Dr. Gould's name. The two descriptions evidently refer to the same species.

Melania exigua.—Turreted; volutions 8, disposed to be angulated and somewhat scalariform above, cancellated, longitudinal lines wanting on the lower half of the body whorl; columella reflected; aperture elliptical. Length one-fifth of an inch. Colorado Desert, California. (*Dr. Le Conte*.)

Fig. 141.



*Melania
exigua*,
enlarged.

The specimens are numerous and of a chalky whiteness, showing that they are all dead shells. Said to have been found one hundred and twenty miles distant from any stream passed on the route. I am indebted to Dr. Caspar Parkinson and Mr. Mactier for specimens. (*Conrad*.)

Fig. 142.



*Trypania
pyrodes*.

Fig. 142 is drawn from one of Dr. Gould's original specimens.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9143	4	Colorado Des.	Prof. Haldeman.	<i>M. exigua</i> , teste <i>Conr.</i>
9356	4	"	Mr. Mactier.	" " "

COCHLIOPA, STIMPSON.

Lingual dentition of the typical species: Rhachidian tooth short and broad; middle lobe of the basal margin very broad; basal teeth rather large. Intermediate tooth with a long peduncle, and square body having a cavity in the centre. Lateral teeth with an expansion of the inner side of the shank, separated from the summit by a deep rounded sinus; the outer lateral being more expanded than the inner. Formula of the denticles: $\frac{11}{2+2} - 8 - 18 - 24$. Shell depressed-conic; base concave, carinated; umbilicus large and deep; aperture oblique. Operculum thin, corneous, sub-spiral. Rostrum of moderate size; tentacles rather long, tapering. Verges rather elongated, compressed, geniculated, and bifid, the inner branch being very small, less than one-fourth the size of the outer one and arising at the inner angle of the geniculation.

Station, fresh water.

Distribution, California. (*Stimpson.*)

Cochliopa rowellii, TRYON.—Shell depressed, wider than high, consisting of $3\frac{1}{2}$ whorls, which are regularly convex and rapidly enlarging; spire small, but little elevated, apex acute, sutures well marked; base convex, except that the region surrounding the umbilicus is flattened and inclining towards the axis, its outer boundary, consequently, is marked by an angle; umbilicus small, but very distinct; aperture half-ovate, the labrum well rounded and thin, the labium but slightly rounded, thickened, elevated from the body-whorl, forming an acute angle with the labrum above, and not impinging on the umbilicus. Surface marked with close, regular, minute striae, which become enlarged in the flattened umbilical region into sharp crowded lines visible without a glass. Color light horn or yellowish, operculum darker. Operculum paucispiral, the lines of accretion very distinct and regular. Length 2.5, diam. maj. 4, min. 3; length of apert. 2, breadth $1\frac{1}{2}$ mill.

Clear Lake, California: Rev. J. Rowell. My cabinet and cab. of Mr. Rowell.

This species cannot be compared with any hitherto described, being much more depressed, and widely distinct in the form of the umbilical region. It may possibly form a species of the genus *Somatogyrus*, recently proposed by my friend Mr. Theo. Gill for a small mollusk from Iowa, which I described in the Proceedings of the Academy for Sept. 1862. (*Tryon.*)

Amnicola rowellii, TRYON, Proc. Phila. Acad. 1863, 147, pl. 1, f. 8, 9.

In addition to the fac-simile of one of the original figures of this species given above, Fig. 144 is drawn from No. 9312 of the collection, which was presented by Mr. Tryon.

Fig. 143.



Amnicola rowellii.

Fig. 144.



Cochliopa rowellii, enlarged.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9312	1	California.	G. W. Tryon.	Fig. 144.

GILLIA, STIMPSON.

Lingual dentition of the type: Rhachidian tooth moderately long, deeply trilobate below; basal teeth close to the basal margin, and projecting beyond it. Intermediate tooth with the body subrhomboidal, slightly excavated in the middle. Outer

lateral tooth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{5}{2+2}-8-14-10$. Shell rather large,

Fig. 145.

Lingual dentition of *Gillia altilis*.—[Stimpson.]

subglobular, thin, subperforate, smooth; spire small; suture not impressed. Aperture large, broad, ovate, oblique; outer lip thin, acute, not projecting anteriorly. Operculum thin, corneous, regularly ovate. Rostrum rather broad. Tentacles tapering, pointed. Verge small, simple, lunate. Ova-capsules hemispherical, each containing a single egg, and deposited singly or in groups or linear series.

Station, fresh water.

Distribution, the eastern parts of the United States of North America. (*Stimpson*.)

***Gillia altilis*, LEA.**—Shell smooth, subglobose, thick, pale horn-color; spire short; sutures small; whirls four, obtusely angular above; aperture large, nearly round, white.

Fig. 146. Santee Canal, South Carolina: Prof. Ravenel; Susquehanna River at Havre de Grace, Md.

*Melania altilis*.

(*Paludina altilis*, Prof. Ravenel's letter.) My cabinet and cabinet of P. H. Nicklin. Diam. .27, length .32 inch.

Last summer I found a number of this globose little species on the banks of the Susquehanna, and then considered it new, but on examination I found I had the same species, Prof. Ravenel having sent it to me years ago under the name of *Paludina altilis*. I am not aware that Prof. R. has ever described it, never having seen any account of it. His specific name for it is retained, but I have placed it among the *Melania*, it having a distinct spiral operculum. It belongs to a natural group in the genus *Melania*, which have very low spires and a very large body whorl. There is a very slight impression on the superior part of the whirls below the suture. The aperture is about two-thirds the length of the shell. The epidermis in young specimens is a very pale yellow, almost white. (*Lea*.)

Melania altilis, LEA, Proc. Am. Phil. Soc. II, 13 (1841); id., 150 (1842); Trans. VIII, 174, pl. v, f. 23; Obs. III, 12 (1843).—DEKAY, N. Y. Moll. 95 (1843).

Paludina altilis, RAVENEL, Cat. (no descr.).

Leptoxis altilis, HALDEMAN, Mon. Lept. 6, pl. v, f. 152 (1847?).

Mr. Lea also gives the river Schuylkill, at Philadelphia, as the habitat of this species (Pr. Am. Phil. Soc. II, 150). I have myself found it in great plenty in the Delaware, at Burlington, crawling on the mud exposed by the fall of the tide, together with *Ammicola limosa* and other species.

Mr. Lea's figure is copied in my Fig. 146.

Judging from the description and figure given by Haldeman of *Leptoxis crenata*, I should be inclined to refer it to this species, especially as its habitat is the same (Santee Canal). I have, however, followed the system of giving all the described species of this genus, without regard to synonymy—it being very difficult to decide doubtful cases. See the remarks under that species.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9217	4	Delaware River, N. J.	W. O. Binney.	.....

Gillia crenata, HALDEMAN.—Shell obliquely transverse, subglobose, polished, rather solid, with four convex whorls, and impressed suture; aperture oblique, very large, angular posteriorly. Peristome continuous on the same plane. Color yellowish-green, aperture white.

Fig. 147.



Leptoxis crenata.

Paludina crenata, SAY in cabinet.
Paludina altilis, RAV. in cab.

Santee Canal, S. C.

Distinguished from *altilis* by its obliquity, greater thickness, straighter and thicker labium, comparatively shorter spire. In other respects the species are much alike. This seems to belong to the same genus as the European shells which Dr. Jay gave me as *Paludina naticoides* and *Lithoglyptus fuscus*. (Haldeman.)

Leptoxis crenata, HALDEMAN, Mon. 6, 67, pl. v, f. 153 (1847?).

The above is a copy of the original description and figure of this species. I am inclined to believe it to be identical with the

Fig. 148.



Leptoxis crenata.

Gillia altilis of the Santee Canal. The shell found in the Delaware, and considered by Mr. Lea as *Melania altilis*, and included by me in the preceding article as a form of *Gillia altilis*, may prove to be a distinct species. If so, its synonymy will be *Leptoxis altilis*, Haldeman, not *Melania altilis*, Lea.

DOUBTFUL SPECIES OF GILLIA.

Leptoxis rapaformis, of HALDEMAN'S Monograph, probably belongs to this genus. The species figured by him without name (pl. v, f. 157) certainly does.

SOMATOGYRUS, GILL.

Lingual dentition of type: Rhachidinn tooth very short and broad. Intermediate tooth with the body perforated. Inner and outer lateral teeth with about the same number of denticles. Formula of the denticles: $\frac{7}{4+4}$ - 7 - 14 - 14. Shell rather large,

Fig. 149.



Lingual dentition of *Somatogyrus depressus*.—[STIMPSON.]

globular, thin, smooth, perforate; spire small; suture impressed; body whirl globose, more or less shouldered above. Aperture large, oblique, rhombo-ovate, narrowly rounded in front and behind, with its peritreme thin and acute, and with its entire margin uniformly in one plane, the outer lip not projecting anteriorly. Operculum rather thick, corneous, subovate; inner margin concave near the upper extremity. Foot rather short. Rostrum broad. Tentacles tapering, pointed.

Station, fresh water.

Distribution, the central parts of North America. (*Stimpson.*)

Somatogyrus depressus, TRYON.—Shell orbicular, sub-hyaline; whorls four, convex, the last large, equalling five-sixths the length of the entire shell; umbilicus narrow; aperture semi-circular, labrum appressed within; suture impressed. Length and breadth four mill. (Fig. mag. $2\frac{1}{2}$ times.)

Hab. Mississippi River, at Davenport, Iowa: Prof. Sheldon. Coll. Acad. Nat. Sciences, and Smithsonian Institution, Prof. D. S. Sheldon, Geo. W. Tryon, Jr.

Shell subhyaline, rather solid, orbicular, with the spire depressed, consisting of four whorls; apex acute, suture profoundly impressed. Body whorl very convex, equalling five-sixths the length of the shell, narrowly umbilicate. Aperture semicircular, the inner lip being nearly straight. The only shell which this resembles is *Viciparis subglobosa*, Say, which differs in being double the size of *A. depressa*, with a rather more exerted spire, and in having a more concave inner lip. (Tryon.)

Amnicola depressa, TRYON, Proc. Ac. N. Sc. Phila. 1862, p. 452.

Somatogyrus depressus, GILL, Pr. Phil. Ac. 1863, 34 (no descr.).

Fig. 150 is drawn from Mr. Tryon's original figure.

Fig. 150.

*Amnicola depressa.*

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
5014	3	Davenport, Ia.	G. W. Tryon.	.....

Somatogyrus isogonus, SAY.—Subglobose, horn-color, volutions about four, rounded, obsoletely wrinkled; spire very short, about one-third the length of the aperture; suture profoundly impressed, so as to form a shoulder on the whorls; aperture much dilated, oval, being as obtusely rounded above as at base; umbilicus linear, distinct; operculum obviously spiral. Length under three-tenths of an inch.

Inhabits Bear Grass Creek, near Lonsieville.

Not very numerous. It is remarkable by the oval form of the much dilated aperture, and by the deeply indented suture. In old specimens the base is almost acutely angulated. (Say.)

Melania isogona, SAY, N. H. Diss. II, 227 (1829); Descr. 19; BINNEY'S ed. 144.

Amnicola isogona, LEA, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16. —WOODWARD, Man. pl. ix, f. 23.

Paludina isogona, DEKAY, N. Y. Moll. 85, pl. vii, f. 133.

Paludina pallida, LEA, Trans. Am. Phil. Soc. VI, 22, pl. xxiii, f. 104 (1839); Obs. III, 22.

?*Paludina fontinalis*, PHILIPPI, Conch. II, 5, p. 2, pl. ii, f. 9 (1846). —KÄSTER, Chemn. ed. 2, 56, pl. x, f. 27, 28.

Fig. 151.

*Somatogyrus isogonus.*

Fig. 152.

*Leptorhis isogona.*

Leptoxis isogona, HALDEMAN, Mon. 6, pl. v, f. 156 (*Mudalia*) (1847?).

Paludina subglobosa, SAY, J. A. N. Sc. V, 125 (1825); BINNEY'S ed. p. 115.—DEKAY, N. Y. Moll. p. 86 (1843).—HALDEMAN, Mon. pl. x, f. 7, 8.

Mr. Lea's description and figure of *Paludina pallida* are copied below.

Paludina pallida.—Shell ventricose, thin, light horn-color, smooth; sutures impressed; whirls four, convex; aperture nearly round.

Near Cincinnati, Ohio: T. G. Lea. My cabinet. Diam. .3

Fig. 153. length .4 inch.



Paludina pallida.

This shell has recently been found by my brother, and I believe has not before been observed. It might at first be mistaken for a young shell, on account of its pale yellow color and translucency. In form, however, it differs from any species I have examined, the last whirl being very much enlarged, and the aperture being very large. (Lea.)

A translation of Philippi's description of *Paludina fontinalis*, and a fac-simile of his figure here follow. The shell described by him may be *S. integer*.

Fig. 154.



Paludina fontinalis

Paludina fontinalis.—Shell minute, subglobose, subperforate, solid, greenish-yellow; whirls four, convex, the last ventricose, twice the length of the shell; aperture ovate, dilated. Height $2\frac{1}{2}$ ''' (lines), diameter $2\frac{1}{4}$ '''; height of the aperture $1\frac{3}{4}$ '''.

Melania integra, SAY (ubi?), according to specimens. Ohio, United States of America. (Philippi.)

An authentic specimen of *Paludina subglobosa*, preserved in the Philadelphia Academy, is without doubt identical with the shell received as Say's *Melania isogona*. A drawing of the specimen and copy of Say's description here follow.

The strict rules of nomenclature would require the substitution of *subglobosus* for *isogonus* as the specific name of this species. It does not, however, seem advisable in this case to abandon the name by which the species has so long been known.

Fig. 155. *Paludina subglobosa*, SAY.—Shell subglobose; whirls three and a half, much rounded, rapidly enlarging; suture profoundly impressed; aperture subovate; umbilicus very narrow, nearly closed by the labrum; spire very short, convex.



Pal. subglobosa.

Inhabits the Northwestern Territory. Length less than three-fourths of an inch.

I obtained this shell when traversing the northwestern part of the Union. It is much larger than the *porata*, nob., which it resembles considerably, but its whorls are much more rapidly enlarged, and the umbilicus is much narrower. (Say.)

Fig. 152 is from Haldeman's Monograph.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9216	2	Ohio.	W. G. Bixney.	.....
9223	3	.....	.....	..... [Ward.
9224	4	Ohio.	Gen. Totten.	<i>Pal. subglobosa</i> , teste

Somatogyrus integer, SAY.—Subglobose, horn-color; volutions rather more than three, rounded, obscurely wrinkled; spire very short, less than half the length of the aperture; suture rather deeply impressed; body whorl large, aperture dilated ovate, acute above; columella flattened, polished; labrum regularly rounded; base regularly rounded, without any undulations or sinus; umbilicus none; operculum obviously spiral. Length nearly one-fifth of an inch. Animal, foot longer than wide, rounded behind, with the anterior angles a little excurved; eyes black, conspicuous; tentacula rather long and slender.

Inhabits the Ohio River and many of its tributaries.

This is a very common little shell, abounding more in many situations than any other species, particularly in the vicinity of the Falls of the Ohio. It may readily be taken for a young shell. (Say.)

Melania integra, SAY, New Harm. Diss. II, 276 (1840); Deser. 19; Bixney's ed. p. 144.—DEKAY, N. Y. Moll. 96 (1843).

Anculotus pumilus, CONRAD, teste HALDEMAN and REEVE.

Anculotus integer, REEVE, Con. Icon. 35 (1861).

Leptoxis integra, HALDEMAN, Mon. Lept. 6, pl. v, f. 154 (1847?).

Amnicola integra, HALDEMAN, Jour. Phila. A. N. S. VIII, 200 (1842).

Paludina fontinalis, PHILIPPI? see last species.

Fig. 156 is copied from Haldeman's Monograph.

Fig. 157 is a fac-simile of the drawing of its lingual dentition, given by Troschel (Gebiss der Schnecken).

Fig. 156.



Leptoxis integra, enlarged.

Fig. 157.



Lingual dentition of *Somatogyrus integer*.

Anculotus pumilus, Conrad, which is considered a synonym in Haldeman's *Leptoxis*, is thus described in New Fresh-Water Shells, p. 62. An authentic specimen in the Academy's collection, at Philadelphia, does not appear to be *A. integra*.

Anculotus pumilus.—Shell very small, obliquely oval, blackish; spire consisting of one entire convex whirl; apex eroded; body whirl regularly convex; base with a groove behind the columella, aperture suborbicular, patulous.

Inhabits the Black Warrior River and Bayou Teche; the latter locality was communicated by Prof. Green, who supplied me with a specimen. (Conrad.)

This species is nearly allied to, if not identical with *Somatogyra isogonus*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9219	2	Ohio. (Pa.	.....	.....
9228	3	Flemington, Centre Co.,	.....	.....

AMNICOLA, GOULD & HALDEMAN.

Jaws present. Lingual dentition of *A. porata*: Rhachidian tooth very short and broad, with a tongue-shaped process from the middle of the anterior surface, reaching beyond the base. Intermediate tooth with a short broad body having a strongly projecting *infero-interior angle, and a very long peduncle. Formula of the denticles: $\frac{7}{4+4}$ - 5 - 18 - 30. Shell small, rather

Fig. 158.



Lingual dentition of *Amnicola porata*.—[STIMPSON.]

short, ovate or subglobular, thin, smooth, perforate; spire not acute. Aperture broadly ovate, not oblique; outer lip thin and

Fig. 159.

Operculum of
Amnicola.

sharp, not projecting anteriorly. Operculum corneous. Foot rather short and broad, expanded and broadly rounded behind. Rostrum short. Tentacles cylindrical, blunt at their tips. Verve short, bifid, with a globular base.

Ova-capsules semi-lenticular in form, with a laminiform limb. Each contains but one egg.

Station, fresh water.

Distribution, North America. (*Stimpson*.)

***Amnicola sayana*, ANTHONY.**—Shell lengthened, conic, composed of six very convex shining whorls; suture strongly impressed; lines of growth very fine; base with a narrow umbilic; aperture suborbicular; the labium slightly flattened, a small portion of it in contact with the body whorl.

Color bright yellowish-brown, translucent. Inhabits south-western Ohio.

It is found on wet earth and roots of trees on the margin of a small stream near Cincinnati. (*Haldeman*.)

Cyclostoma cincinnatiensis, LEA, Oct. 1840, Proc. Am. Phil. S. I, 289; 1843, Tr. Am. Phil. Soc. VIII, 229, pl. vi. f. 62.

Amnicola sayana, HALDEMAN, Mon. p. 19, pl. i, f. 11 (1844?); pt. 4, p. 4 of wrapper (1842); J. A. N. S. Phila. VIII, 200 (1842).—ANTHONY, Cincin. Shells (1843), no desc.

Paludina sayana, KÜSTER in Chemn. ed. 2, p. 49, pl. ix, f. 30—32.

Chiloechelus cincinnatiensis, GILL, Proc. Phila. Ac. 1863, 34 (no desc.).

Cyclostoma sayana, JAY, Cat. [4], 198 (1852), no desc.; *Amnicola*, p. 278.

Troschel (Gebiss der Schnecken, p. 107, pl. viii, f. 1) figures the lingual membrane of this species, and his figure is copied in my figure 162; No. 8934 of the collection is from Mr. Anthony. No. 8971 is labelled by Mr. Lea "*Cyclostoma cincinnatiensis*."

Found in Ohio and New York.

This species was first described by Mr. Lea (in Oct. 1840) as a *Cyclostoma*, under the specific name of *cincinnatiensis*. After the true characters of the genus *Amnicola* had been recognized by Gould and Haldeman, it became necessary to include in it this species. It would then have borne the name of *Amnicola cincinnatiensis*, had not the shell published in Jan. 1840, by Mr. Anthony, as *Paludina cincinnatiensis* also been found to belong

Fig. 160.

Animal of
A. lustrica.

Fig. 161.

*Amnicola*
sayana.

to the genus *Amnicola* and become known as *Amnicola cincinnatiensis*. Mr. Anthony's name, having priority of publication,

Fig. 162.

Lingual dentition of *Amnicola sayana*.—[TROCHEL.]

was retained. He suggested the substitution of *Amnicola sayana* for Mr. Lea's shell, but never described it. Prof. Haldeman followed his suggestion, giving Mr. Anthony as authority for the new name of *Amnicola sayana*. I have personally consulted the works containing the two descriptions and find the internal evidence supports Prof. Haldeman's view of the priority of Mr. Anthony's name. Dr. Stimpson refers this species to *Pomatiopsis*. If included in that genus it should bear the name of *Pomatiopsis cincinnatiensis*, Lea.

Mr. Lea's description and an enlarged view of the outline of his figure here follow:—

Cyclotoma cincinnatiensis.—Shell elevated in the form of a cone, smooth, shining, transparent, umbilicate; whorls 6, apex obtuse; margin of the lip reflected.

Fig. 163.

*Cyclotoma cincinnatiensis*.

Vicinity of Cincinnati. Diam. .13, length .22 inob.

A small species which has been sent to me several times by my brother, who seems first to have observed it. It is about the size, and nearly the color, of *Paludina limosa*, Say. It is found on wet earth and roots of trees, on the margin of a small stream near Cincinnati. (Lea.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks
8966	12	Elyria, O.	W. O. Binney.	.....
8967	10	.....	"	.....
8968	20	Greenwich, N. Y.	Dr. Ingalls.	.....
8969	20+	Little Lakes, N. Y.	Dr. Lewis.	testes, teste Ingalls.
8970	6	Ohio.	J. G. Anthony.	<i>Cyclotoma cincinnati-</i>
8971	2	.....	.....	<i>ensis</i> , teste Lea.
8974	3	Ohio.	J. O. Anthony.	Cabinet series.
9293	5	Outer Tall Creek, Minn.	Kennicott.	.....

***Amnicola porata*, SAY.**—Shell obtusely conic or subglobose; volutions four, convex, obsoletely wrinkled across; spire obtuse; labrum and

labium equally rounded, meeting above in a subacute angle; the upper edge of the latter appressed to the preceding whorl; umbilicus very distinct.

Inhabits Cayuga Lake. Cabinet of the Academy.

This species, which was found by Mr. Jessup, is rather larger and more globose than *P. limosa*, to which it is allied, and has a more distinct umbilicus. It resembles *P. decipiens* of Forasac, but is much less acute, and rather smaller. (Say.)

Fig. 164.

*Amnicola porata.*

Paludina porata, SAY, Journ. Acad. N. Sc. Phila. II, 174 (1821);

BENNETT'S ed. p. 69.—KÜSTER in Chemn. ed. 2 p. 63, pl. xii, f. 4, 5.—

PHILIPPI Abbild. II, t. II, f. 10 (1846), not ADAMS (= *lustrica*).

Amnicola porata, HALDEMAN, Mon. p. 13, pl. i, f. 8 (1844), not of GOULD, INV., LINSLEY, PRESCOTT, MICHELS, ADAMS, &c. (= *limosa*).—DE KAY, N. Y. Moll. p. 88, pl. xxxv, f. 333 (1843).—CHANG, Man. de Couch. II, 308; fig. 2194.

Big Sioux River and Moose Factory are the only other localities of which I have heard.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8978	20+	Big Sioux.	Dr. F. V. Hayden.	.....
8933	"	"	"	Cabinet series.
9025	2	Moose Factory, Br. Am.	C. Drexler.	.....

***Amnicola pallida*, HALD.**—Shell thin in texture, conical, rather robust, composed of four and a half convex whorls, separated by a well marked suture; spire obtuse, rather longer than the aperture; umbilicus narrow; aperture ovate-orbicular, forming an angle posteriorly; a small portion of the labium confluent with the body whorl⁸ posteriorly.

Color pale ochraceous, translucent.

Inhabits Lake Champlain.—Prof. Adams.

Intermediate between *lustrica* and *porata*. It is not as short and transverse as the former, which, moreover, is widely umbilicate, and has the aperture regularly rounded posteriorly. According to the description of Professor Adams, the labium sometimes scarcely touches the body of the shell. The spire is comparatively longer than in *porata*, the outline less transverse, and the aperture not orbicular. (Haldeman.)

*Amnicola pallida.*

Amnicola pallida, HALDEMAN, Mon. pt. 4, p. 3 and 4 of wrapper (1842); Mon. p. 12, pl. i, f. 7 (1844?).

Amnicola lustrica, ADAMS, Thompson's Vermont, 169, 152 (1842), teste HALDEMAN.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8043	3	Little Lakes, N. Y.	Dr. J. Lewis.	Cabinet series.
8074	20+	" "	" "	.....

***Amnicola limosa*, SAY.**—Shell conic, subumbilicate, dark horn colored, generally incrustated with a blackish irregular covering on the spire, and sometimes on the body, which completely obscures the absolutely wrinkled epidermals; aperture ovate-orbicular; suture impressed.



*Amnicola
limosa.*

Length three-twentieths, breadth one-tenth, of an inch. Cabinet of the Academy.

Animal whitish; head brown; mouth, tentacula, orbits, and vitta on each side of the neck, white; tentacula filiform, more than half as long as the base of the animal; rostrum about half as long as the tentacula, annulate with darker fibres above; foot white, brownish above, short, suboval, truncated before, and rounded behind.

Extremely numerous on the muddy shores of the rivers Delaware and Schuylkill, between high and low water marks. (*Say*.)

Paludina limosa, SAY, Journ. Ac. Nat. Sc. Phila. I, 125 (1817).—In. Nieh.

Encycl. 3d ed. (1819); BIRCHT's ed. p. 61.—DE KAY, N. Y. Moll. 88.

Paludina porata, ADAMS in THOMP. Hist. of Vt. p. 152 (1842) (teste HALD.).—PHILIPPI, Z. für Mal. II, 77 (1845).

Amnicola porata, GOULD, Inv. of Mass. p. 229, f. 157 (1841).

Amnicola limosa, HALDEMAN, Mon. 10, pl. I, f. 5, 6 (1844?).—AXENOVUS, Can. Nat. II, 214, fig. (1857).

No. 8960 of the collection is labelled *A. perobdusa* by Dr. James Lewis, but I know of no published description under that name.

From Hudson's Bay and Wisconsin to Virginia.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8053	5	Madison, Wis.	I. A. Lapham.	<i>Isaetrix</i> , teste Lea.
8054	20+	Mohawk, N. Y.	Dr. Lewis.	.....
8055	20+	Burlington, N. J.	W. G. Binney.	.....
8056	12	Washington, D. C.	Dr. E. Foreman.	<i>porata</i> , teste Form.
8057	7	Nantucket.	W. Simpson.	.....
8058	15+	Boston.	"	.....
8059	12+	Millwaukie, Wis.	I. A. Lapham.	.....
8060	20+	New York.	Dr. J. Lewis.	.....
8061	20+	Massachusetts.	W. Simpson.	.....
8062	20+	Little Lakes, Mich.	Dr. J. Lewis.	.....
8063	9	Elyria, O.	W. G. Binney.	.....
8064	100?	Cambridge, Mass.	Dr. J. Lewis.	<i>A. porata</i> , Gould.
8065	2	.....	.....	Teste Lea.
8066	6	Burlington, N. J.	W. G. Binney.	.....
8067	5	Moose Factory.	C. Drexler.	.....

Amnicola decisa, HALD. — Animal dark colored; head blackish, getting lighter posteriorly; tentacles translucent, dark on the edges; an orange-yellow spot at the posterior internal base of the tentacles; foot yellowish, thickly dotted with black above anteriorly; anterior edge nearly as dark as the head; base of the foot thickly dotted with orange on each side of the middle, the dotting being more sparse posteriorly, and entirely wanting anteriorly.

Shell rather short, conical; surface smooth, shining (when the dark foreign matter is removed) lines of growth fine; whorls five, not very convex, sutures impressed, base slightly perforate; aperture dilated, semicircular, labium slightly concave, in contact with the shell posteriorly, and nearly so throughout its length.

Color pale-green, and slightly translucent when the black foreign matter is removed. (See Fig. 160, on p. 81.)

Inhabits small streams connected with the Susquehanna, and has been observed in the Schuylkill by Dr. Griffith.

Allied to *Paludina similis*, Mich., of Europe. A greater portion of the labium lies closer to the shell in this species than in any other here described, except *A. nickliniana*, and *A. tenuipes*, which are slender species. At first view it might be taken for a minute *Paludina decisa*, and I have named it accordingly. In my correspondence I have hitherto called this species *limosa*. (Haldeman.)

Amnicola decisa, HALDEMAN, Mon. p. 7, pl. i, f. 2, 3 (1844?).

Fig. 167.

*Amnicola decisa*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8929 8944	1 17	District of Columbia.	Dr. E. Foreman.	Cabinet series.

Amnicola cincinnatiensis, ANTHONY. — Shell somewhat ventricose, subumbilicate, color delicately green, whorls four, smooth; spire entire at the apex and prominent; suture deeply impressed; aperture much dilated, approaching to orbicular, nearly half the length of the shell; length one-fifth of an inch.

Found in the canal at Cincinnati, clinging to small stones. (Anthony.)

Paludina cincinnatiensis, ANTHONY, Boston J. N. H. III, pt. 1 and 2, p. 279, pl. iii, fig. 3, Jan. 1840. — KÜSTER in Chemn. ed. 2, p. 52, pl. x, f. 13, 14.

Amnicola cincinnatiensis, ANTHONY, List of Cinc. Shells, ed. 2 (1843), no descr. — HALDEMAN, Mon. p. 9, pl. i, f. 4 (1844?). — Dr. KAT, N. Y. Moll. 88 (1843).

Paludina emarginata, KÜSTER, Ch. ed. 2, p. 50, pl. x, f. 3, 4.

"This is the most robust species hitherto noticed among us,

Fig. 168.

*Amnicola cincinnatiensis*.

and is, in form, a miniature representation of *Paludina ponderosa*, except that it is decidedly umbilicated." (Hal-
de-man.)

Fig. 169.



Paludina
emarginata.
 (Mag. 5 times.)

Specimens labelled by Mr. Anthony are in the collection of the Smithsonian. Küster's description now follows. His figure is copied in Fig. 169. He quotes *Lymnæus emarginatus*, Say, as a synonym on authority of Brown.

Paludina emarginata, KÜSTER.—Shell small, narrowly rimate, ovate cone, apex eroded, sub-truncated, shining, thin, delicately striate, dark horn-colored; spire conic, whorls 4, convex; suture deep; aperture ovate; peristome straight, acute, its columellar portion reflected. (Küster.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9020	3	Ohio.	J. G. Anthony.	.....

***Amnicola granum*, SAY.**—Shell conic-ovate; whorls not perceptibly wrinkled, convex; suture deeply impressed; aperture orbicular, hardly angulated above; labium with the superior edge appressed to the surface of the penultimate volution; umbilicus rather small, profound.

Fig. 170.



Amnicola
granum.
 (Mag. 3
 times.)

Length less than one-tenth of an inch. Inhabits Pennsylvania. This very small species is found in plenty in the fish ponds at Harrowgate, crawling on the dead leaves which have fallen to the bottom of the water. It resembles *P. lustrica*, but is a smaller, less elongated shell, and the superior portion of the labium is not an unaltered continuation of the lips as in that shell, but is appressed to the surface of the penultimate whorl in the usual manner of calcareous deposition upon that part. (Say.)

Paludina grana, SAY, JOURN. A. N. SC. II, 378 (1822); BINNEY'S ED. p. 110.
Amnicola granum, HALDEMAN, MOU. p. 17 (1844?);—DE KAY, N. Y. MOLL.
 88 (1843).

Ranges from Lake Superior to Virginia.

Fig. 150 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8000	2	District of Columbia.	I. Lea.	Cabinet series.

Amnicola parva, LEA.—Shell obtusely conical, rather thin, yellowish, smooth, umbilicate; spire short; suture impressed; whorls four, inflated; aperture large, nearly round.

Springfield, Ohio. Diam. .15, length .18 inch.

Fig. 171.

The shell described by Mr. Anthony as *Paludina cincinnatiensis*, resembles this species, but is more elevated in the spire, and is a larger shell. It is more nearly allied to *Amnicola orbiculata*, herein described, but may be distinguished by its being a smaller shell, and being less round in the aperture. The base of the lip is disposed to be slightly angular; the aperture is about one half the length of the shell. (Lea.)



Amnicola parva.

Amnicola parva, LEA, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841).—HALDEMAN, Mon. p. 24 (1844?).

Figure 151 is drawn from Mr. Lea's original specimen.

Amnicola orbiculata, LEA.—Shell orbicular, rather thin, yellowish, smooth, umbilicate; spire short; sutures much impressed; whorls five, inflated; aperture large, round.

Springfield, Ohio. Schuylkill? near Philadelphia. Diam. .18, length .18 inch.

Fig. 172.

This species is very nearly allied to *Am. parva*, and may prove to be only a variety of it. The specimens before me are all larger, and they appear to be more globose. The aperture is about half the length of the shell. I found a single specimen of this species among many small shells which were thrown together in a box, as being collected from our vicinity. It may be possible it is an Ohio specimen gotten by mistake into the box. Found also in Cayuga Lake. (Lea.)



Amnicola orbiculata.

Amnicola orbiculata, LEA, Tr. Am. Phil. Soc. IX, 16 (1844); Obs. IV, 16; Proc. II, 34 (1841).—HALDEMAN, Mon. p. 24 (1844?).

Figure 153 is drawn from Mr. Lea's original specimen.

Amnicola longinqua, GOULD.—Shell small, elongate-ovate, smooth; apex obtuse; whorls 5, rounded; suture deep; aperture elliptical, rounded posteriorly; columella very arcuate, sub-perforate. Length one-eighth, breadth one-tenth inch.

Fig. 173.

Found in the Colorado Desert (Cienaga Grande) by W. P. Blake.

In form it is much like *A. cincinnatiensis*, Hald., or like *A. galbana*, or like miniature specimens of *Paludina ponderosa*. It has a bleached or chalky color, probably from exposure, like the



Amnicola longinqua.

other species found on the Cienaga Grande, a region which is immersed a portion of the time, and dry the remainder, and was once, apparently, an extensive marsh, or shallow lake. (Gould.)

Amnicola longisqua, GOULD, Pr. Bost. S. N. H. V, 130 (Mar. 1855); P. R. R. Report, V, 333, pl. xi, fig. 10, 11 (1857); Prelim. Rep. App. 24 (1855); Otia, 217.

Fig. 173 is a fac-simile of the original figures referred to.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9230	6	Colorado Desert.	Blake.	Type.

DOUBTFUL AND SPURIOUS SPECIES OF AMNICOLA.

Amnicola integra, SAY of ANTHONY'S List of Cincinnati Shells is *Somatogyrus integer*.

Amnicola gracilis, GOULD, mentioned by name only, from Hot Springs, Va. Pr. A. N. S. Phil. II, 167. The New Zealand species of this name is the same as *Amnicola egea*, GLN., vide Otia, p. 245.

Amnicola elongata, JAY, Cat. [4] 278, Virginia; no descr.

Amnicola arminalis, COOPER, P. R. R. Rep. XII, pt. 2, p. 374. Vide *Fluminicola nuttalliana*.

Amnicola nuttalliana, COOPER, (l. c.), p. 374. Vide *Fluminicola nuttalliana*.

The following are mentioned by name only in WHEATLEY'S Cat. of U. S. Shells. No description of them was ever published.

Amnicola albilabris, WARD, Ohio.

Amnicola sayana, LEA, Ohio.

Amnicola dentata, SAY, Florida.

Amnicola pallida, LEA. See *Somatogyrus isogonus*.

Amnicola gibbosa, ASTH.

FOSSIL SPECIES OF AMNICOLA.

Amnicola galbana, HALD.—Shell conical, smooth, shining, composed of four and a half not very convex whorls, having the lines of growth very fine; base with a narrow umbilic; aperture nearly circular, slightly produced in an angle posteriorly; labium slightly thickened; a small portion of it, which is rectilinear, in slight contact with the body whorl.

Fig. 174.



Amnicola galbana.

Color . . . bleached and chalky.

Occurs fossil in the fresh water newest tertiary deposit in Sussex County, New Jersey. (Haldeman.)

Amnicola galbana, HALDEMAN, Mon. p. 15, pl. I, f. 9 (1844?); pt. 4, p. 4 of wrapper (1842).

FLUMINICOLA, STIMPSON.

Lingual dentition of the type: Rhachidian tooth more than twice as broad as long. Outer lateral teeth with a smaller number of denticles than the inner. Formula of the denticles: $\frac{5}{3+3} - 6 - 10 - 7$.

Fig. 175.

Lingual dentition of *Fluminicola nuttalliana*.

Shell comparatively large, obliquely ovate, thick, smooth, imperforate; spire moderate, obtuse. Aperture ovate; inner lip flattened, callous; outer lip effuse and projecting anteriorly, so that the peritreme is not continuously in the same plane. Operculum corneous. Tentacles tapering. Rostrum rather large. Foot broad. Verges large, compressed, with a broad semicircular laminaform expansion or wing on its left side. Ova-capsules large, circular, depressed, almost discoidal, each containing a large number of eggs.

Station, fresh water.

Distribution, Oregon and California. (*Stimpson.*)

Fluminicola nuttalliana, LEA. — Shell subglobose, horn-colored, smooth; sutures rather impressed; whorls 4; aperture white, nearly round.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .3, length .4 inch.

There is a very close resemblance between this species and *P. nuclea* (herein described). It is, however, less oblique, larger and less elevated in the spire. (*Lea.*)

Fig. 176.

*Paludina nuttalliana*.

Paludina nuttalliana, LEA, Tr. Am. Phil. Soc. VI, 101, pl. xxiii, f. 109 (1839); Obs. II, 101.

Amnicola nuttalliana, COOPER, P. E. R. Rep. p. 374 (no descr.) (1859).

Paludina seminalis, HINDS, Voy. of the Sulphur, p. 59, pl. xvi, f. 22 18

(1844); Arch. f. Nat. 1843, II, 130; Annals Nat. Hist. X, 83, pl. vi, f. 8.

?*Leptoxis nuttalliana*, HALDEMAN, Mon. Lept. 6, pl. v, f. 156 (1847?).

Ancelotus nuttallii, REEVE, Can. Icon. 46 (1861) (excl. syn. *A. fuscus*).

Bithynia seminolis, CARPENTER, Brit. Ass. Ad. Sc. 1857, 326, no descr.

Amnicola seminolis, COOPER, P. R. R. Rep. XII, 374 (1859), no descr.

Amnicola hindsi, BAIRD, Pr. Zool. Soc. Lond. 1863, 67.

A very common species through Oregon and California. It was originally described and figured (as copied above) under the name of *Paludina*, and has since been referred to the genera

Amnicola, *Bithynia*, and *Leptoxis*. Its outward features are most closely allied to those of the last mentioned genus. I should have considered it a *Leptoxis* had not Dr. Stimpson discovered its true characters. From the other genera to which it has been referred it is readily distinguished by its horny subspiral operculum and thick shell.

Fig. 177.



*Pluvinicola
nuttalliana*,
enlarged.

I have seen no authentic specimen of *Paludina seminolis*, but have no doubt of No. 9212 and 9213 of the collection being referable to it. The original description and figure are copied below. It is from them I am induced to place it in the synonymy of *nuttalliana*, as done by Haldeman.

Fig. 178.



*Pal.
seminolis*.

Paludina seminolis, HIXPS.—Shell obtusely turreted, solid, horn colored, smooth; apex eroded; whorls 4; aperture bluish, expanded.

River Sacramento, California.

Distinguished from *P. nuclea*, Lea, which is from a neighboring locality, by its somewhat smaller size, bluish instead of white mouth, having one whirl less, the aperture more expanded, and absence of the black lines round the mouth, which when present is so good a character in his shell, but which, in any numerous specimens of it, I do not find at all constant, and usually only to be seen in those better developed. *Amodon angulatus* is also found abundant in this river, &c. (*Hinds*.)

I have not seen an authentic specimen of *Amnicola hindsi*. By the kindness of Mr. Carpenter I am able to give a translation of the original description and copy of the original figures. The latter will be published in the Report of the British N. A. Boundary Commission. The species seems to me identical with *Pluvinicola nuttalliana*.

Amnicola hindsi, BAIRD.—Shell obtuse, rather solid, greenish-olive, with delicate longitudinal wavy striae and ill-defined transverse furrows; apex eroded; whorls four, the last one bluntly carinate near the middle, channelled at the impressed sutures; columella white; aperture bluish.

River Kootanie and stream at foot of Rocky Mountains, British Columbia.

Differs from *Paludina seminolis*, Hinds, in contour, being bluntly carinate round the middle of the last whorl, and in being channelled round the suture. The surface of the shell is distinctly marked with numerous flexuose striae, the lines of growth, and near the sutures is rather indistinctly marked with circular striae. (Baird.)

Fig. 179.

*Amnicola hindsi*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9231	6	Columbia Riv. (ville Or.	Dr. Cooper.	.....
9226	1	Bogue's R., Jackson-	.....	.....
9227	30+	Upper des Chutes R., Or.	Newberry.	.....
9230	13	"	"	.....
9231	3	Willamette River, Or.	"	.....
9232	20+	Canon Creek, Cal.	"	.....
9233	8	Pitt River, Cal.	"	.....
9234	11	E. br. of Klamath R., Or.	"	.....
9302	8	California.	"	Type, Fig. 177.
9212	5	Oregon and W. T.	"	<i>Pal. seminolis</i> .
9243	2	"	"	.....

***Fluminicola virens*, LEA.**—Shell oblique, thick, somewhat granose, green; whorls rather inflated; aperture ovate.

Wahlamat, near its junction with the Columbia River: Prof. Nuttall. My cabinet; cabinet of Prof. Nuttall. Diam. .2, length .4 inch. Fig. 180.

The apices of all the specimens which Prof. Nuttall gave me are destroyed, so that it is impossible to give some of the characters of this species. It is remarkably solid for so small a species. (Lea.)

*Paludina virens*.

Paludina virens, LEA, Tr. Am. Phil. Soc. VI, 91, pl. xxiii, f. 93 (1839); Obs. II, 93.

Leptoxis virens, HALDEMAN, Lept. 5, pl. v, f. 147-150 (1847?). See my Fig. 181.

Paludina nuclea, LEA (l. c.), VI, 91, pl. xxiii, f. 103 (1839); Obs. II, 91.

Haldeman, l. c., places doubtfully in the synonymy *Pal. nuclea*, Lea, of which the original description and figure are given below.

Fig. 181.

*Leptoxis virens*.

Paludina nuclea, LEA.—Shell obtusely truncated, solid, horn-color, smooth; sutures impressed; whorls 5; aperture white, oval.

Fig. 182.

*Pal. nuxia.*

Wahiamat, near its junction with the Columbia River. Prof. Nuttall. My cabinet. Cabinet of Prof. Nuttall. Diameter .2, length .4 inch.

This is a small, solid species, and is more oblique than *P. decisa*, Say. Like it, the apex is usually out off. Round the mouth there is a black border, which contrasts with the pale horn-colored epidermis. (Lea.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9223	2	Willamette River, Or.	.....	.....

Fluminicola fusca, HALDEMAN.—Shell subglobos, conic, smooth; spire loosened, with excoriated apex. Whorls subangular, forming posteriorly a slight projection on account of the labium turning abruptly at the suture, which is thus made conspicuous. Aperture rounded, posteriorly produced into a moderate angle. Columella thickened, somewhat concave, scarcely emarginate. Peristome nearly uniform. Color reddish, labrum white.

Fig. 183.

*Leptoxis fusca.*

Inhabits Oregon Territory.

Somewhat resembles the preceding (*L. pisum*), but easily distinguished by the straighter labium and want of columellar emargination. In Fig. 84 the lines of growth are heavier, and a disposition is seen to form encircling striae. (Haldeman.)

Fig. 185.

*Leptoxis fusca.*

Leptoxis fusca, HALDEMAN, Mon. Lept. 4, pl. III, iv, f. 83, 84 (1847?).

To this species, of which the original description and figures are given above, I refer numerous specimens from Utah, Oregon, &c., in the collection.

Reeve quotes this species as *Anculotus fuscus* in the synonymy of *Anc. nuttalli*.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9221	4	Head of Green R., Utah.	Mallomey.	.....
9222	6	Shores of Lake Utah.	Capt. Barton.	.....

Fig. 184.

*Leptoxis fusca.*

POMATIOPSIS, TAYLOR.

Jaws like those of *Amnicola*, though smaller. Lingual membrane with numerous rows of 3, 1, 3 teeth; centrals small, broader at base, cusp recurved and tridentate, base with two obtuse denticles; laterals longer than broad, cusp recurved and denticulate, the inner lateral much broader than the two outer ones.

Fig. 186.

Lingual dentition of *Pomatiopsis lapidaria*.—[BRUNSON.]

Tentacles short, subulate, pointed, rostrum large, longer than the tentacles. Foot broad. Verge very large, flattened, broad, convoluted in a spiral coil of one and a half turns. Ova capsules — ? Shell small, thin, smooth, long, subumbilicate. Spire turreted. Aperture ovate, peristome reflected. Operculum corneous.

Eastern North America.

Terrestrial.

Fig. 187.

Animal of *P. lapidaria*, enlarged.

***Pomatiopsis lapidaria*, SAY.**—Shell turreted, subumbilicate, with six volutions, which are obsolete wrinkled across. Suture impressed. Aperture longitudinally ovate-orbicular, operculated, rather more than one-third of the length of the shell.

Length about one-fifth of an inch. Collection of the Academy of Natural Sciences.

Inhabitant not so long as the shell, pale; head elongated into a rostrum as long as the tentacula, and emarginate at tip; tentacula two, filiform, acuminate at tip, short; eyes prominent, situated at the external or

Fig. 188.

*Pomatiopsis lapidaria*.

posterior base of the tentacula; base or foot of the animal dilated, oval, obtuse before and behind.

Found under stones, &c., in moist situations, on the margins of rivers. Like those of the genera *Lymnaea* and *Planorbis*, this animal possesses the faculty of crawling on the surface of the water, in a reversed position, the shell downward. (Say.)

Cyclostoma lapidaria, SAY, Journ. A. N. S. Phila. I, 13 (1817); BINNEY'S ed. 59.

Amnicola lapidaria, HALDEMAN, Mon. p. 18, pl. i, f. 10 (1844?); Journ. A. N. S. Phila. VIII, 200 (1842).

Paludina lapidaria, SAY, Nich. Ency. 3d ed. (1819); BINNEY'S ed., p. 56. —KÜSTER in Chemn., ed. 2, p. 54, pl. x, f. 21, 22.—DEKAY, N. Y. Moll. 86 (1843).

Melania lapidaria, LEWIS, Bost. Proc. VIII, 255; Phila. Pr. 1862, 290 (no descr.).

Pomatiopsis lapidaria, TRYON, Proc. Phila. Acad. 1862, 452 (no descr.).

This is a widely distributed species, ranging at least from Georgia to New York, and from Missouri to Michigan. It is also found in the postpleiocene of the Mississippi River bluffs.

I have already given a figure of the animal and lingual dentition (Figs. 186 and 187).

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8945	9	North Georgia.	A. Gerhardt.	.....
8946	9	Ohio?	J. G. Anthony.	.....
8947	8	Dist. of Columbia.	Dr. E. Foreman.	.....
8948	25+	.....	.....	.....
8949	20+	Ann Arbor, Mich.	W. G. Binney.	.....
8950	6	St. Louis.	"	Post-pleiocene?
8951	10+	New York.	Dr. J. Lewis.	.....
8952	20+	Elyria, O.	W. G. Binney.	.....
8953	3	New York.	Dr. J. Lewis.	Cabinet series.

***Pomatiopsis lustrica*, SAY.**—Shell conic; whorls slightly wrinkled, convex; suture profoundly indented; aperture oval, nearly orbicular; labrum with the superior edge not appressed to the preceding whorl, but simply touching it; umbilicus rather large, rounded.

Length, less than one-tenth of an inch. Cabinet of the Academy.

The smallest species I have seen. The aperture somewhat resembles that of a *Valvata*, to which genus it may probably be referable. Mr. Jessup obtained two specimens on the shore of Cayuga Lake. (Say.)

Paludina lustrica, SAY, Journ. A. N. S. Phila. II, 175 (1821); BINNEY'S



Pomatiopsis lustrica.

Fig. 189.

ed. p. 69.—KÜSTER in Chemn. ed. 2, p. 63, pl. xii, f. 6, 7, not of ADAMS (= *pallida*).

Amnicola lustrica, HALDENEY, Mon. p. 16 (1844).—DEKAY, N. Y. Moll. 87 (1843).

Found also in Wisconsin and British America.

Fig. 189 is drawn from an authentic specimen given by Mr. Say to the Philadelphia Academy.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8075	20+	Mohawk River, N. Y.	Dr. Lewis.	.....
8080	..	"	"	Cabinet series.
8077	2	Four Lakes, Wis.	I. A. Lapham.	.....
9019	3	Moore Factory.	C. Drexler.	.....

FAMILY CYCLOPHORIDÆ.

Lingual membrane narrow, with seven rows of recurved, hooked teeth. Head proboscideiform; tentacles subulate; eyes on the outer side of the base of the tentacles. Foot elongated. Operculum distinctly spiral, testaceous, cartilaginous or horny; whirls very numerous and sub-equal, or few and rapidly increasing. Shell usually covered with a horny epidermis; aperture, for the most part, circular.

SUBFAMILY CYCLOSTOMINÆ.

Operculum ovate, rarely subcircular, composed of a few gradually increasing whirls; nucleus somewhat excentric.

CHONDROPOMA, PRR.

Animal short, tentacles slender, enlarged at tips; eyes prominent, situated on a tubercle at the external base of the tentacles. Proboscis bifurcate. Operculum oval, subcartilaginous, flat, with few, rapidly increasing whirls, and a nucleus generally very excentric. Shell oblong-turreted, generally



Fig. 191.



Operculum of *C. dentatum*.

truncated at tip, more rarely globosely conic; aperture oval;

peristome simple, or more or less thickened, somewhat straight, rather expanded or broadly reflected.

Chondropoma dentatum, SAY.—Shell conic cylindrical, or turreted, truncate at tip, the surface finely caucellate with raised, longitudinal, and revolving lines; color varying from yellowish to brown, usually with darker brown bands, which are generally interrupted in such a manner that the colors also form longitudinal stripes; whorls, when complete, seven; but the three uppermost are usually lost; they are rounded, and separated by a deep, crenulated suture; aperture rounded ovate, a little angular posteriorly; peristome a little reflexed, white; base with a minute perforation. Length 12, breadth 4 mill.

Fig. 192.



Chondropoma dentatum.

Cyclostoma dentatum, SAY, JOURN. PHILA. AC. V, 125: BISSEY's ed. 29.—DEKAY, N. Y. Moll. 82.—BINNEY, Terr. Moll. II, 348, pl. lxii.
Chondropoma dentatum, PFEIFFER, MON. PNEUM. VIV. I, 286; II, 140; Mal. Blatt. 1856, 132.—GRAY & PFEIFFER, Brit. Mus. Cat. PHAN. 203.—W. G. BINNEY, Terr. Moll. IV, 91, pl. lxxv, f. 24.

Key West: Fort Dallas, Florida.

Animal (see Fig. 190): Body very short, pale, tentacles darker, slender, somewhat enlarged at tips; eyes black, prominent, situated on a tubercle at the external base of the tentacles. Proboscis bifurcate, the two points serving the purpose of buccal tentacles. Operculum horny, the spiral of about two and a half turns.

Fig. 193.



Operculum of
C. dentatum.

The shell is carried somewhat laterally, and very little elevated. The motions of the animal are very rapid; the locomotive disk contracts in an undulatory manner; and when the animal has advanced so that the shell

Fig. 194.



C. dentatum at rest, enlarged.

drags along by its side, by a sudden contraction of the neck the tip of the shell is suddenly jerked forward, so as to bring the shell at right angles with it; and this movement, in a quarter of a circle, is very rapidly performed. As the operculum prevents the animal, when at rest and retired within its shell, from adhering by means of its foot, as is usual with the *Helicidae*, the animal has the power of spinning

a short thread, which is attached to the object of support; and by this it hangs suspended at pleasure.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8334	7	Florida.	W. O. Blandy.	Cabinet series.

SPURIOUS SPECIES OF CYCLOPHORIDÆ.

Cyclotoma cincinnaticensis, LEA, not ANTHONY & DEKAY, is an *Amnicola*, and *C. lapidaria*, SAY, LINSLEY, and KIRTLAND, is a species of *Pomatopsia*, q. v.

Cyclotoma marginalis, KIRTLAND (Ohio Rep.), and *C. marginata*, SAY, are species of *Pupa*, q. v.

Cyclotoma tricarinata, SAY, is a *Valvata*.

Ctenopoma rugulosum, PREIFFER, may, perhaps, prove an inhabitant of Florida. A single specimen found there is here figured.

Fig. 195.



Ctenopoma rugulosum.

FAMILY TRUNCATELLIDÆ.

Lingual membrane with seven rows of recurved, hooked teeth. Animal with a broad, produced, bilobed muzzle, tentacles flattened, sub-triangular, eyes sessile on the middle of their upper bases. Foot very short and rounded. Operculum horny, subspiral. Shell lengthened, truncated, with a rounded aperture.

TRUNCATELLA, RISSO.

Animal with a small foot, against the end of which rests the operculum when the animal is withdrawn; the tentacles are short, acute; the snout is extended beyond them as much as the whole length of the animal. The shell is carried horizontally. Operculum horny, hardly spiral, with a basal nucleus. Shell imperforate, but with an umbilical groove, cylindrical, turreted, usually pellucid and smooth, of a reddish horn-color; the upper whorls

Fig. 196.



Animal of *Truncatella*.

are also truncated in the adult, the remaining ones are usually gradually increasing in size, and covered with more or less strongly developed ribs; the peristome is simple or double, sometimes reflected; the base is generally furnished with a prominent carina or ridge, formed by the peristome. Aperture rounded.

Dr. Gray describes *Truncatella* with distinct white jaws.

The teeth of *T. caribæensis*, by Troschel: Central rather narrow, conical, apex recurved; first lateral very broad, apex recurved, denticulate; second lateral narrower, denticulated; outer lateral narrow, simple.

Fig. 197.



Lingual dentition of *Truncatella caribæensis*.—[TROSCHEL.]

***Truncatella caribæensis*, SOWN.**—Shell subrimate, subcylindrical, rather solid, in its truncated state but slightly decreasing in size towards the apex, reddish, or dark amber-colored, with delicate ribs, which are but little curved, and often hardly perceptible on the middle of the whorls; suture slight; whorls not truncated, three or four, distinctly increasing in size, equally convex, the last often smooth, slightly carinated on its base; aperture subvertical, ovally elliptic, angular above; peristome continuous, straight, thickened at its connection with the penultimate whorl. Length 7-8, diameter 3 millimetres; length of aperture $2\frac{1}{2}$ millimetres.

Fig. 198.



Truncatella caribæensis, enlarged.

Truncatella caribæensis, SOWERBY MSS.—REEVE, Conch.

Syst. II, t. cxxxii, f. 7.—PFRIFFER in Zeitsch. f.

Mal. 1846, 182; Mon. Auric. Viv. II, 185; Mon.

Phan. Viv. II, 7; Brit. Mus. Cat. 134.—W. G.

BUXLEY, T. M. IV, 185, pl. lxxv, f. 2, 4.—CHESNITT,

ed. 2; Auric. p. 9, pl. I, f. 35, 36; pl. II, f. 23; not pl. II, f. 2-4.

Truncatella gouldii, ADAMS, ined.

Truncatella succinea, ADAMS, Proc. Bost. Soc. 1845, 12.

Florida Keys, Mexico, Alabama; also Cuba and Jamaica.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
3334	3	Florida.	W. G. Blassey.	Cabinet series.

Truncatella bilabiata, FRÖ.—Shell subrimate, cylindrical, elegant, solid, opaque, brownish; ribs subarcuate, elevated, obtuse, at equal distances; suture deep and simple; remaining whorls $4\frac{1}{2}$ to 5, convex, the last scarcely longer than the others, heavy and subcompressed at base; aperture vertical, oval, scarcely angular above; peristome double, the outer one white, heavy, and terminating in the basal ridge or carina, the inner one continuous. Length $5\frac{1}{2}$, breadth $1\frac{1}{2}$; length of aperture $1\frac{1}{2}$ millimetres.

Truncatella bilabiata, FRÖHNER in Wieg. Arch. 1840, I, 253; in Zeit. f. Mal. 1846, 187; Mon. Aurio. Viv. 192; Mon. Pneum. Viv. II, 8; Brit. Mus. Cat. 140.—W. G. BINNEY, T. M. IV, 188, pl. lxxv, f. 3, 7.—CHEMNITZ, ed. 2, p. 7, pl. i, f. 27-31.

Florida, Cuba, Carmen Island.

Fig. 199.



Truncatella bilabiata, enlarged.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8352	3	Florida.	W. G. Binney.	Cabinet series.

Truncatella pulchella, FRÖ.—Shell subrimate, oblongly sub-cylindrical, light, reddish horn-color or amber, shining, polinoid, lightly ribbed; ribs scarcely elevated, thread-like, at irregular intervals, often more distinct at the moderate suture; remaining whorls 4 to $4\frac{1}{2}$, rather convex, gradually increasing in size, the last generally smooth below the middle, compressly carinated at its base; aperture sub-vertical, obliquely elliptical, enlarging at base; peristome simple, continuous, somewhat expanding, and furnished with a slight ridge at its right extremity. Length $4\frac{1}{2}$ -5, of aperture $1\frac{1}{2}$ mill.

Truncatella pulchella, FRÖHNER in Wieg. Arch. 1839, I, 356; in Zeitsch. f. Mal. 1846, 186; in Mon. Aurio. Viv. 192; Mon. Pneum. Viv. II, 8; Brit. Mus. Cat. 140.—W. G. BINNEY, T. M. IV, 188, pl. lxxv, f. 1, 9, 10.—CHEMNITZ, ed. 2, Aurio. 10, pl. II, f. 11-15.

Florida. Also a West Indian species.

Fig. 200.



Truncatella pulchella, enlarged.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
5533	2	Florida.	W. G. Binney.	Cabinet series.

Truncatella subcylindrica, GRAY.—Shell scarcely rimate, cylindrical, furnished with regular, crowded ribs, less prominent or obsolete at the suture, shining, pellucid, yellowish horn-color or hyaline; remaining whorls four, rather convex, flattened in the middle, regularly increasing, the last not ridged on the base; aperture vertical, ample, angularly oval, sub-effuse at base; peristome lightly thickened, its external margin sub-produced, the columellar portion briefly reflected, appressed and above thickened. Length 5, breadth 2 mill.

Fig. 201.



Truncatella subcylindrica, enlarged.

Helix subcylindrica, PULTSEY, Cat. Dorsetsh. 49.—MONTAGU, Test. Br. ii, 393.

Truncatella subcylindrica, GRAY in THURTON'S MAN. 22, f. 6.—SHUTTLEWORTH, Diagn. 7, 154.—PFEIFFER, MON. ANNE. Viv. 187; MON. PHAN. Viv. II, 7; BR. MUS. Cat. 136.—W. G. BIRNEY, T. M. IV, 186, pl. lxxv, f. 5, 6, 8.—ORRISON, Mell. Cub. ii, 5 (excl. *T. truncatula*).

Truncatella truncatula, LÖW in Zool. Proc. 1845, 217?; in Zool. Journ. V. p. 299, tab. xiii, f. 13-18?

Truncatella caribænsis, PFEIFFER in Zeitsch. f. Mal. 1846, 182, ex parte.—KÖSTER in CHEMM. ed. 2, ANNE. pl. II, f. 1-4.

A West Indian species found on the Florida Keys.

Truncatella californica, PFR.—Shell not rimate, cylindrical, truncated at tip, thin and translucent with light striae, shining, amber-colored; spire in the perfect state of the shell composed of about ten whorls, of which four only are not deciduous; these are convex, increasing in size rather rapidly; aperture oval, vertical, rounded above; peristome simple and continuous, slightly expanded, its pillar margin scarcely attached to the shell. Length 4½, diam. 1½ mill.

Fig. 202.



Truncatella californica, enlarged.

Truncatella californica, PFEIFFER, Proc. Zool. Soc. London, May, 1857, 111; MON. PHAN. Viv. II, 7.—W. G. BIRNEY, T. M. U. S. IV, 28, pl. lxxix, f. 20, 22.

Truncatella gracilentia, GÜLD, Proc. Phila. Ac. Nat. Sc. X, 1858, errata.

San Diego, California.

FAMILY NERITIDÆ.

Jaws two, above and below, with denticulated margins. Lingual dentition very similar to that of the *Trochidae*; the central teeth few, the lateral hooks, or uncine, very numer-

ous. Head with a broad, short muzzle; tentacles slender and subulate, with the eyes on stout peduncles at their outer

Fig. 203.

Lingual dentition of *Neritella rectata*.

bases; no head-lobes or neck-lappets. Foot oblong, triangular, the sides simple, without filaments, or lateral membrane. Operculum articulated, shelly, subspiral. Shell depressed or oval, not umbilicated; spire very short, cavity simple from the absorption of the internal portions of the whorls; aperture semioval, not pearly within.

In this tribe of Scutibranchiate mollusks the sides of the foot are without membranaceous fringes and tentacular filaments; the animal is not voluminous, and the foot is small and never envelops the shell; in their dental system they resemble the *Trochidae*, as also in their muzzle-shaped heads and pedunculated eyes. They are littoral animals, inhabiting the stones and rocks along the shore, feeding on the algae that abound in that situation. They appear to be more active during the night, resembling in this respect, the *Patchidae*, which are said to enjoy considerable locomotive powers at that time.

There are several genera included in this family which are not fluviatile, and therefore not noticed by me. Such are *Nerita*, *Clithon*, and *Catillus*. The genus *Neritella* alone is referred to.

NERITELLA, HUMPHREY.

Operculum testaceous, the outer surface smooth, with two apophyses, the upper shorter, sometimes dilated and crested, the lateral in the form of an arched rib. Shell globose, oval, turriculated or conical, thin, often depressed, covered with a horny epidermis; aperture semilunar; inner

Fig. 204.

Operculum of *Neritella rectata*.

lip straight, flattened, the margin smooth or denticulated; outer lip simple internally.

The *Neritellæ* are tolerably numerous in species; they are inhabitants of fresh water, and are usually covered with an epidermis; some among them are found crawling on the stones in shallow water; others live in deeper water, half buried in the mud, some in brackish and others even in salt water; some are amphibious, clinging to the roots of Nipah palms and other trees on the margins of rivers, while a few inhabit the foliage of tall trees that overhang ponds and rivulets. The genus *Neritella*, as restricted, is characterized by the shell being transverse, elliptical or hemispherical; the spire lateral or none; the inner lip septiform, flattened and striolate, with the margin finely denticulate; with one or two exceptions they are not found in the frigid or temperate zones, but are extensively distributed in every other part of the world.

I adopt the name *Neritella*, instead of *Neritina*, on account of its having precedence. I presume a description was published by Humphreys, but do not have access to a copy of the *Museum Coloniense*. *Neritella* is generally preferred in the more recent works on Conchology.

The genus *Neritella*, as restricted by Messrs. Adams, contains no North American species. The following are the subgenera proposed by them, with the American species quoted in each:—

Subgenus *Neritina*, Sw. (*Clithon*, RECLUZ).—Shell globular, oval or turriculated, smooth or spirally striated, often adorned with vivid and varied colors; inner lip septiform, crenulated, rarely simple.

N. cassiculum.

N. sayana.

N. reclinata.

Subgenus *Vitta*, KLEIN (*Theodoxus*, MONTF.; *Elen*, ZIEGL.).—Shell transverse, smooth or nearly smooth; spire lateral, inclined over the aperture, more or less prominent; inner lip usually flat, with the margin simple or denticulated; operculum uniform, without colored zones.

N. jayana.

N. picta.

Subgenus *Dostia*, GRAY (*Sandoliformes*, MITRULA, MKX.).—Shell slipper-shaped, solid; apex entirely posterior, rolled in a half turn on the

side; peritreme continuous and free; inner lip septiform, the margin united to the inner portion of the peritreme, slightly arched in the centre, and denticulate.

(No American species.)

Subgenus **Alima**, RECLUZ.—Shell depressed, suborbicular, with the upper extremity of the outer margin prolonged into a lateral wing; spire subposterior and lateral; inner lip septiform, margin finely denticulate.

(No American species.)

Subgenus **Neripteron**, LESSON.—Shell cauliform, with the two extremities of the outer margin prolonged into lateral antricles; spire subposterior and lateral; inner lip septiform; margin finely denticulate.

(No American species.)

Neritella reclivata, SAY.—Shell thick, strong, globose-oval, greenish-olive, with numerous approximate, parallel, irregularly undulated green lines across the velutions; velutions about three, the exterior one occupying nearly the whole shell; spire very short, obtuse at the apex, and frequently eroded to a level with the superior edge of the body whorl; mouth within bluish-white; labrum acutely edged; labium callous, minutely crenated

Fig. 205.



Neritella reclivata.

Fig. 206.



Operculum of
Neritella reclivata.

on the edge, and with a small tooth near the middle. Greatest diameter nineteen-twentieths of an inch; greatest transverse diameter four-fifths of an inch.

Inhabits East Florida. Cabinet of the Academy and Philadelphia Museum.

Animal pale or less distinctly lineated, or clouded with black; foot rounded, almost orbicular, hardly as long as the shell is broad; above with four more or less distinct, black, parallel lines; rostrum dilated, truncated, tip with four black lines, a black band connecting the eyes; eyes prominent, appearing to be placed on a tubercle at the outer base of the tentacula, black, with a white orbit; tentacula with darker or black lines, setaceous, and longer than the breadth of the rostrum; beneath immaculate.

I found this species in great plenty, inhabiting St. John's River in East Florida, from its mouth to Fort Picolata, a distance of a hundred miles, where the water was potable. It seemed to exist equally well where the water was salt as that of the ocean, and where the intermixture of that condiment could not be detected by the taste. Its movements are remarkably slow. (Say.)

Theodoxus reclinatus, SAY, Journ. A. N. Sc. Phila. II, 257; BINNEY'S ed. 67.

Neritina reclinata, REEVE, Con. Icon. 34 a, b, Oct. 1855.

Neritina floridana, SHUTTLEWORTH IN REEVE, Con. Icon. 85 a ? Nov. 1855.

Fig. 207 represents the lingual dentition of this species, from a

Fig. 207.



Lingual dentition of *Neritella reclinata*.

specimen presented the Smithsonian Institution by Prof. Agassiz. The lingual plate is composed of 48 rows; median tooth small, slightly tridentate; first lateral large, trapeziform; second and third lateral minute, simple; uncini 18 or 19, first large, marked with one large denticle, flanked by ten minute denticles; the rest close set, long, slender, recurved, and blunt at ends.

Reeve quotes it from Mexico.

I have seen no authentic specimen of *Neritina floridana*, Shuttl., placing it in the synonymy after a study of Reeve's description and figure, which are copied below.

- " *Neritina floridana*.—Shell compressly-globose, rather solid, spire obtuse, whorls rather flattened at the upper part, columellar area callous; greenish-white, densely elegantly painted with very fine olive lines.

Fig. 208.



Neritina floridana.

Neritina floridana, SHUTTLEWORTH MS. in Museum Cuming.

Florida. Closely allied to *Neritina reclinata*, from which it scarcely differs, except in being of a more stunted growth. (Reeve.)

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9299	1	Florida.	L. Agassiz.	Fig. 207.
9307	..	"	"	Fig. 208.

***Neritella californica*, REEVE.**—Shell ovate, rather thin, concave beneath, spire rather narrowly produced, obtusely flattened at the apex, whorls smooth, aperture expanded, columellar area concavely flattened,

rather broad; black, blue within, columellar area deep blood-stained.

Gulf of California. This appears to be distinct from any of its congeners in form, while the deep-toned coloring is characteristic. (Reeve.)

Neritina californica, REEVE, CON. ICON. 20,
a, b (Oct. 1855).

I have seen no authentic specimen of this species, the original description and figure of which are given above.

Neritella cassiculum, SOWERBY.—Of a globose form, slightly inclining to oval, with an olive-green epidermis, under which may be seen numerous black lines, angulated so as to leave white, triangular spots, which are larger in three bands across the shell; spire obtuse, consisting of four whorls; aperture semicircular, with the outer lip slightly thickened and the columella inclining to orange, narrow, swelled, and minutely crenulated on its nearly straight edge. Locality unknown. (Sowerby.)

Neritina cassiculum, SOWERBY, CONCH. III. f. 55; THES.

CONCH. 521, pl. cvi, f. 194.—CARPENTER, MAS.

Shells (1855), 256; Brit. Mus. Rep. pl. ix, f. 5 (1857).

Carpenter quotes this species from Mazatlan. I have seen no specimen, but give above the original description and figure.

Neritella picta, SOWERBY.—Subglobose, grayish, variably painted, with black lines or reticulations and whitish spots. There is a peculiar enamel-like appearance about the external surface; the columella is invariably of a chestnut color, rather swelled, and obscurely crenulated at the margin.

Panama, on a mud bank, partially overflowed with fresh water: Cuming. (Sowerby.)

Neritina picta, SOWERBY, PR. Zool. Soc. 1832, 201; Illustr.

pl. lxxxvi, f. 1; THES. CONCH. 530, pl. cxvi, f. 267-9.

—REEVE, CON. ICON. 101.—DEHAES in LAMARCK, VIII, 588.—CARPENTER, MAS. Cat. 259 (1856).

A very variable species found within the limits included in my work—at Mazatlan, as well as further south. The original description and figure are given above.

There is a *Neritina picta*, of Ferussac (Hist. fig. 4-7), found

Fig. 209.



Neritina californica.

Fig. 210.



Neritina cassiculum.

Fig. 211.



Neritina picta.

fossil in France. Some of the references quoted above are referred to Ferussac's species by Grateloup (Soc. Lin. Bord. XI, 127). I have not the means of settling the synonymy.

***Neritella showalteri*, LEA.**—Shell smooth, rounded, semitransparent, yellowish horn-color; spire very much depressed; sutures slightly impressed; whorls three, inflated; aperture semi-rotund; inner lip dilated, white, thickened, without teeth and incurved; outer lip acute, dilated and thin. Operculum—?

Fig. 212.

*Neritella showalteri*.

Coosa River, ten miles above Fort William, Shelby County, Alabama; E. R. Showalter, M. D. My cabinet, and cabinets of Dr. Showalter and Dr. Lewis, and Academy of Natural Sciences. Diam. .22, length .18 inch.

The discovery of this shell by Dr. Showalter marks the first notice, I believe, of the genus *Neritina* being found in our waters. His very close observation and active investigations of the waters of central and northern Alabama have enabled him to lay the naturalists of this country under many obligations by new discoveries, and this is certainly one of much importance. We now see for the first time that this genus, which is common in Europe, Africa, Asia, South America, and the West Indies, also inhabits our southern rivers. I have great pleasure in naming the species after the discoverer. This species is not allied to any which has come under my notice. It is more rotund than usual, has a clear horn-colored epidermis, smooth and shining. The substance of the shell is so thin as to permit the column to be visible through it. The inner lip is broad and slightly notched where it is in contact to the body whorl. It is to be regretted that among the four specimens sent to me by Dr. Showalter neither had an operculum. The soft parts have not yet been observed. (Lea.)

Neritella showalteri, LEA, Pr. Acad. Nat. Sc. Phila. 1861, 55; Journal [U. S.], V, pt. 3, 267, pl. xxxv, f. 78, 78a (Mar. 1863); Obs. IX, 89.

I can add nothing to the knowledge of this species contained in Mr. Lea's description copied above. One of his figures is copied in my Fig. 212.

***Neritella jayana*, RACLET.**—Shell rather small, transversely-ovate, thin, concentrically and delicately striated, yellowish under the epidermis, varied with delicate angularly-flexuose, reticulated, small black lines and small white spots; behind generally of a uniform black; whorls three, almost conic above, and with a narrow cancellated suture; spire inclined towards the side; labium compressed, white with black spots, edentulate and scarcely arched in the centre; labrum greenish-yellow. Height $4\frac{1}{2}$, breadth 6, thickness 3 mill.

Fig. 213.

*Neritella jayana*.

North America?

We are indebted for this little species to Dr. Jay, of New York, in whose honor it is named. It cannot be confounded with the European species *N. fluvialilis*—of which it is the American analogue—not only on account of its constant coloration, but still more on account of its conical spire and canalculated suture. (Recluz.)

Neritina jayana, RECLUZ, JOURN. de Conch. I, 157, pl. vii, f. 13 (1850).

I am unable to add any information regarding this species or its habitat, further than what is contained in the above copy of the original description and figure.

SPURIOUS SPECIES OF NERITELLA.

Neritina striata, BESLERI, from New Orleans is quoted in the synonymy of *Neritina zebra*, BARO., of Cayenne, by RECLUZ, in JOURN. de Conch. I, 152, and

Neritina zigzag, SOWERBY, from Florida, as a synonym of *Neritina lineolata*, LAM., of Cayenne. I can find no description or further information regarding the former, or any authority for the habitat given of the latter.

FAMILY HELICINIDÆ.

Lingual membrane long, narrow, with numerous longitudinal series of teeth, arranged 00, 5, 1, 5, 00; see description of *Helicina orbiculata*, on p. 108. Head probosciform; tentacles subulate, with the eyes at their outer bases. Foot elongated. Operculum non-spiral, annular, semi-oval or sub-triangular, with concentric elements, thick and testaceous, or thin and horny. Shell with the aperture semilunar.

HELICINA, LAM.

Animal long, heliiform, tentacles slender, drooping, eyes at their external base; proboscis truncated. Operculum non-spiral, somewhat semioval, membranous or testaceous. Shell

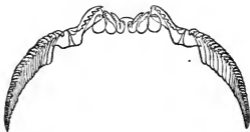


what flattened, and rather straight; aperture tri-



angularly semioval, entire; peristome simple, straight or thickened, often widely expanded. No horny jaw. Lingual mem-

Fig. 216.

Lingual dentition of *Helicina orbiculata*.—[TACCHET.]

brane with teeth arranged 00, 5, 1, 5, 00. Centrals small, apex broad, reflected; first and second laterals broader, rounded at base, apex recurved, denticulated; third lateral suboval, apex recurved, denticulated; fourth lateral long, narrow, irregular shaped, apex recurved, denticulated; uncini long, narrow, apex recurved, denticulated.

Subgenus **OLIGYRA**, SAY.

Shell subglobose or conic; spire equalling or excelling the last whirl, whirls eecarinate; peristome expanded.

***Helicina orbiculata*, SAY.**—Shell subglobose, acute at apex, solid, smooth, very delicately striated; color yellowish, brownish, or ash-colored, with a linear, pale zone at the periphery, which passes up the spire at the suture, and makes it white; there are also in many specimens numerous capillary zones, and some specimens are mottled with pale spots; whorls five, well rounded, suture well impressed; aperture rather large, semilunar; peristome white, moderately reflexed, and often greatly thickened and protruded by age; columella short, joining

Fig. 217.

*Helicina orbiculata*, enlarged.

the peritreme at nearly a right angle, and forming thereby a denticular protuberance; base delicately enamelled. Diameter 2, height 6 mill.

Helicina (Oliggyra) orbiculata, SAY, Journ. Phila. Ac. I, 283; Nioh. Encycl. ed. 3; Am. Conch. 5, pl. xlv, f. 1-3; ed. BINNEY, 36, pl. xlv, f. 1-3; ed. CHESU, Bibl. Conch. 111, 58, pl. xv, f. 2, 2 a, 2 c.—GRAY, Zool. Journ. 1, 70.—BINNEY, T. Moll. 11, 352, pl. lxxiii, lxxiv, f. 3.—DEKAY, N. Y. Moll. 82 (1843).—CHENNITZ, ed. 2, 74 (1846), pl. x, f. 32, 33.—PFEIFFER, Mon. Pneu. Viv. I, 375; 11, 199 (excl. *H. rubella*).—GRAY & PFEIFFER, Brit. Mus. Phan. 272 (not of SOWERBY).—W. G. BINNEY, T. M. 1V, 193, pl. lxxv, f. 18-20.

Helicina tropica, JAN in CHENNITZ, ed. 2, p. 37, pl. 1v, f. 9, 10.—PFEIFFER, Mon. Pneu. Viv. I, 375; 11, 199.—GRAY & PFEIFFER, Brit. Mus. Phan. p. 271.—W. G. BINNEY, T. M. 1V, 194.—TROSCHEL, Gebiss d. Schn. p. 81, pl. v, f. 9.

Helicina ambeliana, SOWERBY, Thes. Tab. 8, pl. i, f. 19 (1842), not ROISSY.

Helicina costanea, SOWERBY, l. c., 13, pl. i, f. 31, 32.

Helicina vestita, GÜLDING in SOWERBY, l. c., p. 14, pl. i, f. 42.

Helicina minuta? SOWERBY, l. c., f. 40, 41.

Texas to Georgia; Tennessee to Florida. Also in the post-pleiocene of the Mississippi Valley.

Animal (see Fig. 214): Head and tentacles black, the other parts of the body dark. Tentacles long and slender, tapering to a point. Eyes black and prominent. Motion gliding as in *Helix*. Operculum horny, turning back upon the columella as if upon a hinge.

This species seems to be distributed over a very wide extent of territory, and also to be subject to great variations in size and coloring. From specimens collected in company, within a very small area, individuals might be selected differing so widely from each other that no one would hesitate to regard them as very different species, unless their history were known.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8443	5	Texas.	G. Wurdemann.	.....
8444	1	.....	.....	.....
8445	3	St. Simon's Island, Ga.	Dr. J. Lewis.	.....
8446	3	.....	W. G. Binney.	.....
8446	75	Texas.	Lieut. Couch.	Cabinet series, (<i>H. tropica</i> .)
8447	22	Indianola, Tex.	.....	"
8448	44	Tumaculipa, Mex.	Lieut. Couch.	"
8449	2	"	"	"
8448	5	Texas.	W. G. Binney.	" Cab. ser
8449	300?	"	"	"
8452	..	Hot Spr., Ark.	Dr. B. Powell.	.....

***Helicina hanleyana*, PFR.**—Shell globose-conic, rather solid, marked with impressed concentric, rather spaced lines; scarcely transparent, shining, reddish horn-colored; spire shortly conic, obtuse; whorls five, scarcely convex, the last rounded, slightly descending before; aperture slightly oblique, sub-semicircular; columella very short, denticulated without, with a diffuse, light white callus; peristome white, scarcely expanded, thickened within, ending in a basal columellar denticle. Greater diam. $7\frac{1}{2}$, less $6\frac{1}{2}$, height $5\frac{1}{2}$ mill.



*Helicina
hanleyana.*

Helicina hanleyana, PFEIFFER in Proc. Zool. Soc. 1848, 122; Mon. Pneum. Viv. I, 376.—CHERNITZ, ed. 2, 45, pl. ix, f. 7, 8.—GRAY and PFEIFFER, Brit. Mus. Phan. 302.—W. G. BINNEY, T. M. IV, 192, pl. lxxv, f. 14, 16.

Near New Orleans.

***Helicina chrysocheila*, BINNEY.**—Shell broad conic, or pyramidal, thin, shining, pale yellow, with the surface finely shagreened with microscopic, punctured lines; spire elevated, whorls five, moderately convex, the last one somewhat flattened at base and indistinctly angular at the periphery; aperture large, very oblique, semi-oval, the diameters about equal; the peristome broadly everted, especially at its middle portion, narrow and simple at its columellar junction, of a golden-yellow color; parietal callus extended, of a deep orange color. Diameter 10, height 8 mill.

Fig. 219.



*Helicina
chrysocheila.*

Helicina chrysocheila, BINNEY, Terr. Moll. II, 354, pl. lxxiv, f. 4.—W. G. BINNEY, Terr. Moll. IV, 192.—PFEIFFER, Mon. Pneum. II, 197 (not of SHUTTLAWORTH).

Texas and Tampico in Mexico.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
8335	1	Texas.	G. Wurdemann.	Cabinet series.
8336	..	Tamaulipas, Mex.	Lieut. Conch.	"

***Helicina subglobulosa*, FORY.**—Shell globose-conic, solid, lightly striate, rather shining, uniformly white, or marked with two red bands, one broad near the suture, other narrow, near the periphery; spire convex-conic, rather sharp; whorls six, the upper ones flattened, the penultimate

more convex, subtriangulate, the last subeariate, rather convex below; columella short, arched, dilated, marked with a white line, and covered with a light callus; aperture rather oblique, irregularly semioval; peristoma wide, angularly spreading, sub-excavated, narrowing at each extremity. Greater diam. 10, lesser $8\frac{1}{2}$, height 7 mill. (Pfeiffer.)

Fig. 220.



*Helicina
subglobulosa.*

Helicina subglobulosa, POEY, Mem. I, 115, 120, tab. xii, f. 17-21.—PFEIFFER, Malak. Blatt. 1854, 107; 1856, 146; Mon. Pnsum. Viv. II, 209.—W. G. BINNEY, T. M. IV, 195, pl. lxxv, f. 17.

Fort Dallas and Key Biscayne, Florida. Also Cuba.

The specimens received may, perhaps, be referable to *Hel. subdepressa*, Poey.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
5540	1	Fort Dallas, Fla.	W. G. Binney.	Cabinet series.

SPURIOUS SPECIES OF HELICINA.

Helicina fastigiata and *plicata* of DEKAY, N. Y. Moll. 82, are respectively *Helix fastigans* and *Helix hazardi*.

FOSSIL SPECIES OF HELICINA.

Helicina occulta, SAY.—Shell small, rather solid, low conical, acute at apex, cretaceous, obviously striated; spire of five nearly plans whorls, the last of which is angular at the periphery, and this angle continuing up the spire adjacent to the suture, makes it appear double; the aperture is small, semi-linear; the peristome is scarcely reflexed, but is thickened internally; the columella is very short, and joins the peristome by a slightly waving curve, without forming an angle. Diameter 6, height 5 mill.

Fig. 221.



*Helicina
occulta.*

Helicina occulta, SAY, Transylv. Journ. of Med. IV, 528 (1831); Deser. of New Terr. and Fluv. Shells (from the Diss.), p. 15 (1840); Am. Couch. V, pl. xlii, f. 4-6 (1832): ed. BINNEY, p. 37, pl. xlii, f. 1-3.—BINNEY, Terr. Moll. U. S. II, 356, pl. lxxiv, f. 1, 2.—DEKAY, N. Y. Moll. 82 (1843).—PFEIFFER, Mon. Pnsum. Viv. I, 347.—CHAMNITZ, ed. 2, 18 (1846), pl. iv, f. 11, 12 (1850).—GRAY &

PREIFFER, Brit. Mus. PHAN. 250.—W. G. BIRNEY, T. M. IV, 193.

Helicina rubella, GREEN, in Doughty Cat. II, 291 (1832).

Very plenty in the postpleiocene beds of the West.

Cat. No.	No. of Sp.	Locality.	From whom rec'd.	Remarks.
8442	1	Sheboygan, Wis.	I. A. Lapham.	Fossil. Color remain-
8537	2	.....	W. O. Binney.	" Cab. ser. (ing
8805	1	.....	W. Simpson.	"

APPENDIX TO VIVIPARIDÆ, ETC.

Since the first portion of the preceding pages was printed the following additional species have been received:—

Pomus depressa. (Page 3.)

I am now able to give a figure of the jaws of this species.

Fig. 222.



Jaws of *Pomus depressa*.
a. Top view. b. Side view.

Valvata pupoides, GOULD. (Page 13.)

A better view of this species than Fig. 19 is here given.

Fig. 223.



Valvata pupoides.

Page 14. The description of *Valvata humeralis* should have been accredited to Say.

Vivipara contectoides. (Page 23.)

The figure of this species here given is to be substituted for that given on page 23, which incorrectly shows but three revolving bands. There are invariably four on all the specimens I have examined.

Fig. 224.



Vivipara contectoides.

I neglected to state in the text that I did not adopt *linearis* as the specific name in this case, because it was probably a typographical error for *lineata* in Küster's monograph, and because it does not apply to the shell in question.

Vivipara inornata.—Shell minutely perforated, globose-conic, thin, smooth, polished, lines of growth extremely delicate on the body whorl, imperceptible above; color uniformly greenish or pale olive, unadorned with any revolving lines; the suture impressed, spine short, conical;

apex acute, distinct, not truncated; whorls regularly increasing, inflated, the last globose, equalling about two-thirds of the shell's length; aperture oblique, rounded, large; lip continuous in one plane; peristome thin, acute, continuous; columellar extremity appressed to the body whorl, almost entirely concealing a minute umbilicus; parietal wall of the aperture covered with a thin, shining, colorless callus. Length of axis 19 mill., breadth 17 mill.

Near Chapatilo, Mexico.

Vivipara inornata, W. G. Bixey, Am. Journ. Conch. I, 49, 1865, pl. vii, f. 1.



Vivipara inornata.

It is after a very careful examination of the specimens brought from Chapatilo, that I have decided to propose for them a specific name. Having submitted them to several experienced Conchologists, I find my decision approved by them. It can be compared with no known American form.

The smooth, polished surface, unbroken by revolving lines, the pale olive color and acute apex, are the more prominent features of it.

About a dozen specimens were brought. On one is an obtuse, ill-defined carina on the middle of the body whorl.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
9198	1	Near Chapatilo, Mex.	.....	Type.
9218	2	"	.....	.....

Fig. 226.

MELANTHO. (Page 35.)



Melantho,
Bowditch.

Bowditch thus describes and figures *Melantho* as a subgenus of *Melania* (Elem. Conch. 1822, p. 27, pl. iv, f. 15):—

Peristome incomplete, not effusive; very thick; white. Subglobular. Marine.

***Melantho decampi*, CERRIER.**—Shell ovate, oblong, imperforate, rather thick, irregularly roughened by occasional coarse wrinkles of growth, decussated by delicate revolving and longitudinal striae; greenish olive, with revolving dark broad lines when young, darker when old; suture impressed, spire elevated, but truncated; remaining whorls three, of which the two upper are flattened, the lower sub-convex, with a median obtuse

carina, reaching to, and modifying the peristome; aperture higher than broad, roundly lunate, produced below; bluish within; peristome simple, acute, sinuous, angular above at the termination of the carina. Greater diameter, including aperture, 22 mill., length 35 mill.; length of the aperture 20 mill., diameter 10 millimetres.

Fig. 227.

*Melantho decampi*.

Operculum horny, concentric.

Melantho decampi, W. G. BRANN, Am.
Journ. Conch. I, 49, 1865, pl. vii,
f. 2, 3.

Huntsville or Stevenson, Alabama:
Dr. W. H. DeCamp, 1st Michigan
Vol. Engineers.

This species was given me by Mr.

A. O. Currier, of Grand Rapids, Michigan, who suggested its bearing the name of its discoverer.

About a dozen specimens were collected. All but the one drawn in Fig. 227 could not be distinguished from *Melania* without the presence of the operculum, thus furnishing another example of the impossibility of ascertaining from the shell alone the generic position of some species. It is probable that other species of *Melantho* have been described as *Melanie*.

Fig. 227 was photographed from nature on wood. It represents the largest and oldest specimen. Fig. 229 is drawn from a younger individual.

Fig. 228.

Operculum
of *Melantho*
decampi.

Fig. 229.

*Melantho*
decampi.

Cat. No.	No. of Sp.	Locality.	From whom received.	Remarks.
2299	2	Huntsville or Steven- son, Ala.	Currier.	Type. Fig. 227-9.

Gillia ——— ?

From Stephenson, Ala., and Powell's River, Tenn., has lately been received a new species of *Gillia*, here figured.

Fig. 230.

*Gillia*
—

On page 63. *Paludina altilis* should have been referred to *Gillia*.

Paludina pallida, *subglobosa*, *fontinalis*, and
isogona to *Somatogyrus isogonus*.
Paludina lustrica to *Pomatiopsis*.

Fig. 231.

Helicina ——— ?*Helicina ——— ?*

The Smithsonian Institution has just received from Mr. Xantus a specimen of *Helicina* from the Sierra Madre. I do not propose a name for it, as it may already have been described in Europe. A figure is here given, almost twice the natural size, and a figure of the lingual dentition.

Fig. 232.

Lingual dentition of *Helicina* ——— ?

INDEX.

In the present index all synonyms and spurious species are in *italics*. Where several references are given for one name, the first relates generally to the page containing the full description.

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